EXPORT NUMBER

EDITORIAL INDEX—PAGE 169.
BUYERS' DIRECTORY—PAGE 147.
ADVERTISING INDEX—PAGE 170.

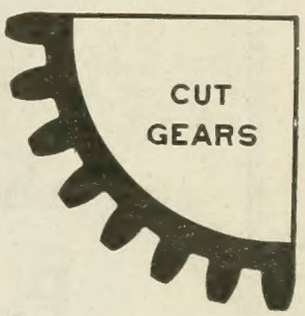
CANADIAN MACHINERY AND MANUFACTURING NEWS

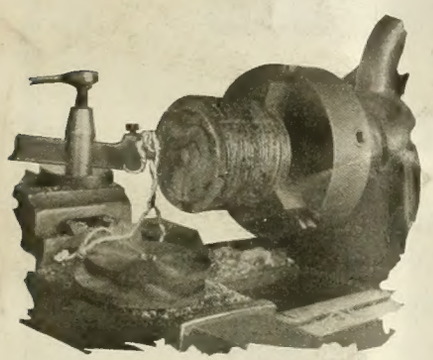
The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, New York, Chicago, Boston and London, Eng.

Vol. XXI. No. 23. Publication Office: Toronto, JUNE 5, 1919 Subscription Price $3.00 per Year

SILENT RAW-HIDE PINIONS

Showing the operations in their production





Rough turn bronze flanges and block of compressed raw-hide discs.

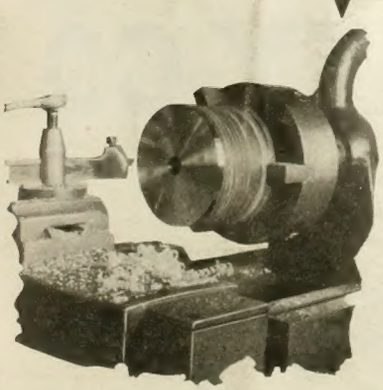
Write or wire

HAMILTON GEAR CO. LTD.

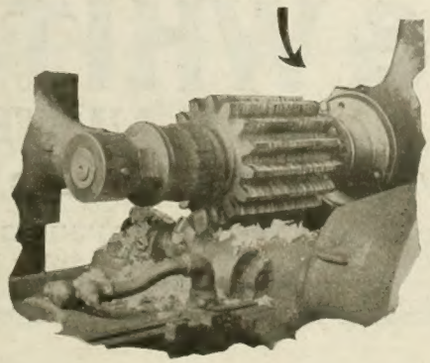
Van Horne St., TORONTO



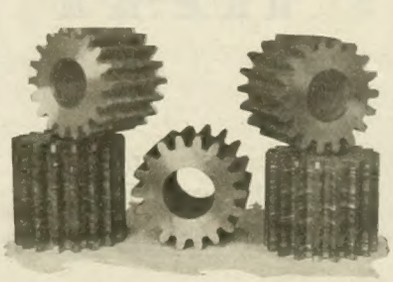
Drill and countersink and assemble with long rivets.



Finish bore and turn all over, and key seat.



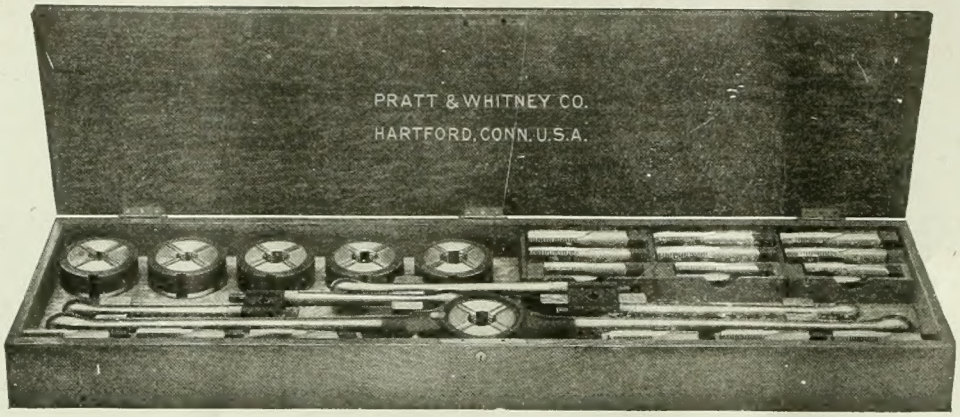
Cut teeth on Brown & Sharpe No. 4 Gear Cutter.



The finished product, when carefully made of selected material, is thoroughly reliable, silent and durable.

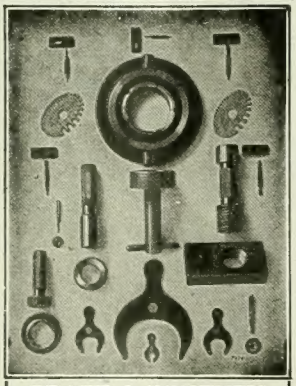
LIBRARY
JUN 16 1922
UNIVERSITY OF TORONTO

SMALL TOOLS



P. & W. Die-Stock Set No. 4

These sets are furnished in various capacities for either U.S. Standard, S.A.E. Standard, Whitworth Standard or "V" Form. The Pratt & Whitney Policy of highest quality materials, together with the necessary refinement and accuracy, is maintained in all tools composing these sets.



PRATT & WHITNEY
Standards and Gauges
Accuracy Unequalled

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

PRATT & WHITNEY CO.
OF CANADA, LIMITED

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

42-inch Vertical Boring and Turning Mill

Motor driven through speed box. Built in sizes from 42-inch to 100-inch.

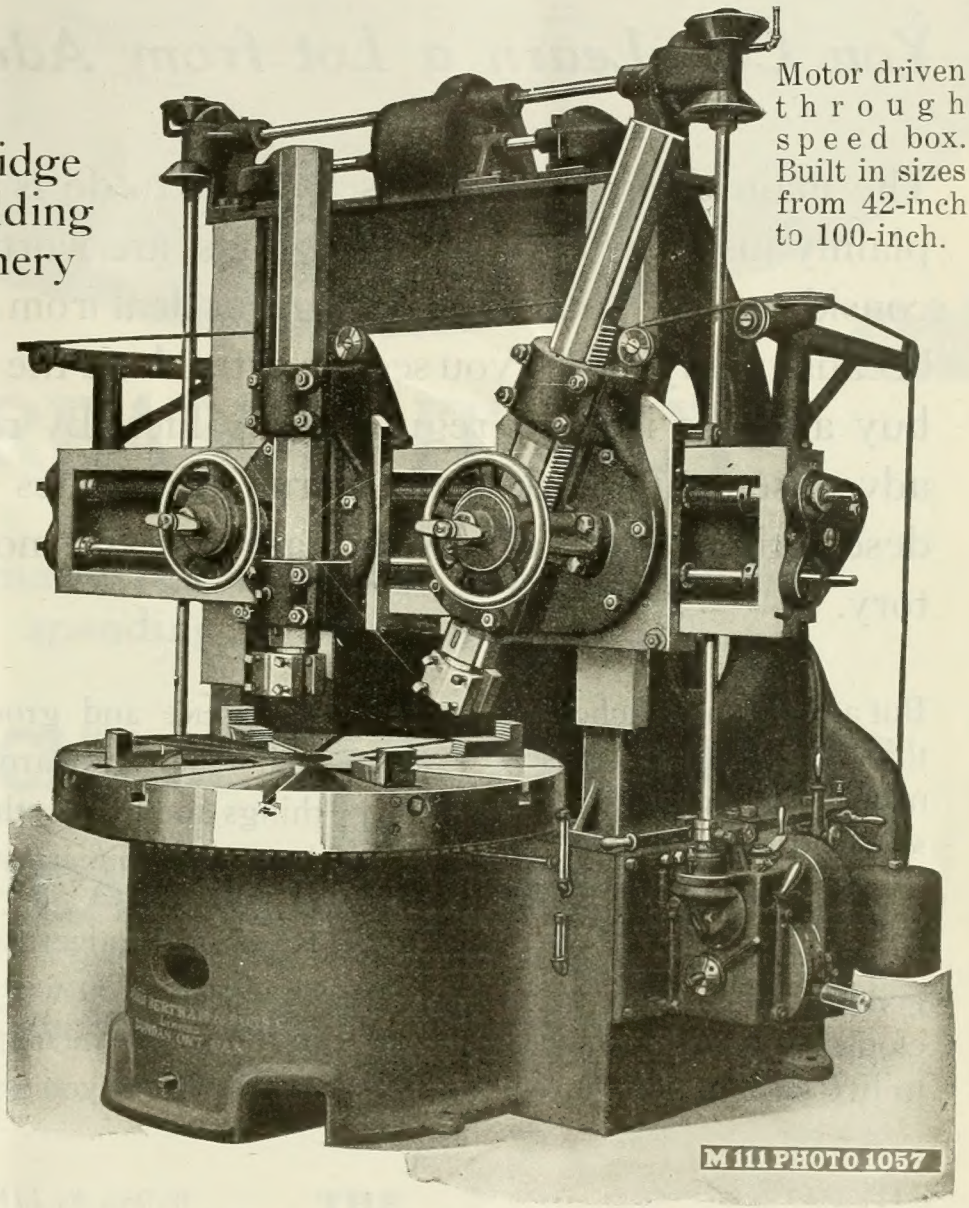
Structural Bridge Shop Shipbuilding Plant Machinery

Locomotive and Car Shop Equipment

Repair Shop Machinery

General Machine Shop Equipment

Drop us a line for Photographs and full particulars.



The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. | TORONTO 1002 C.P.R. Bldg. | VANCOUVER 609 Bank of Ottawa Bldg. | WINNIPEG 1203 McArthur Bldg.

The Publisher's Page

TORONTO JUNE 5, 1919

You Can Learn a Lot from Advertising

The main thing an advertiser wants to do is to tell you plainly just how and why his goods are worthy of your consideration. You can learn a great deal from that alone, because many things you see advertised are the things you buy and use in your regular daily life. By reading the advertisements, you can learn the names and read descriptions of the things that are best and most satisfactory.

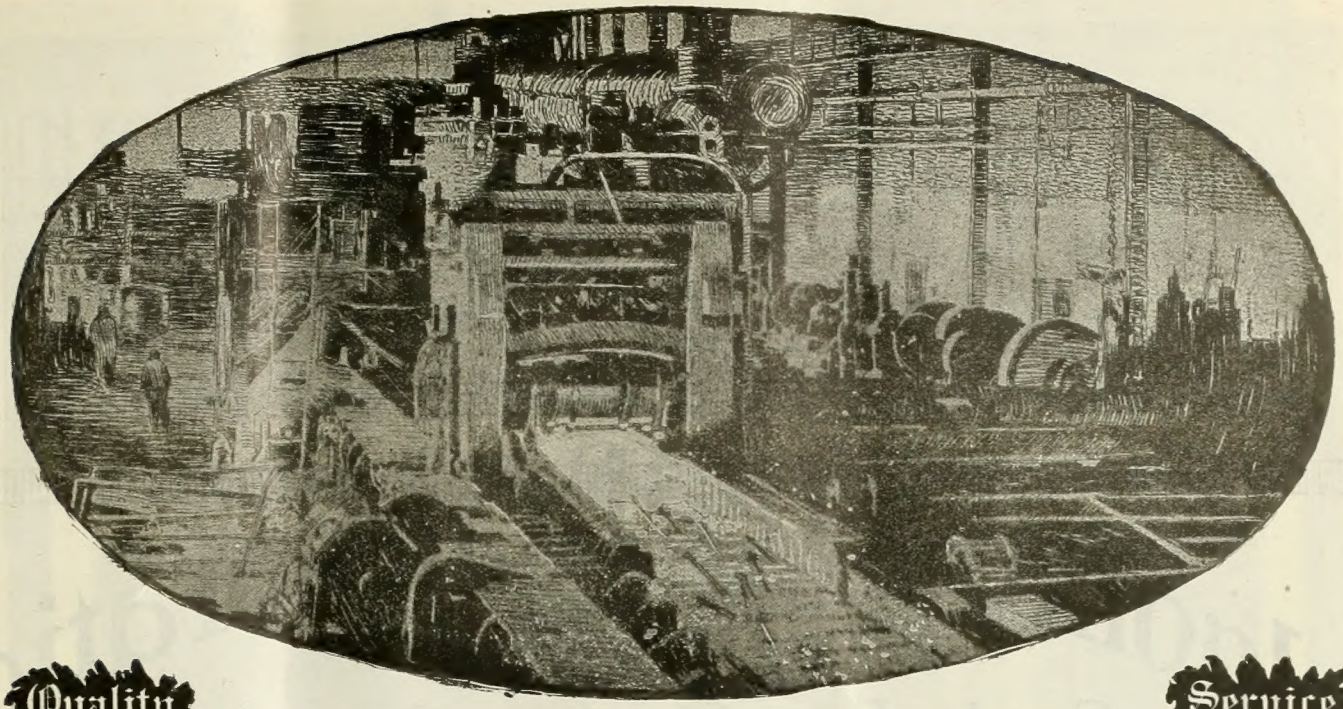
But advertising teaches even more than that. All advertisers try to make their advertisements themselves valuable to you.

A good many people have learned a whole lot about good music, good books, good food, good clothes, ways to keep healthy, ways to live comfortably, ways to keep the house and grounds looking well—they've learned all these things and many other things *just by reading advertisements.*

Read the advertisements right along, and you will learn a great deal that will be helpful and valuable to you as you go through life.

Written by LIFE'S advertising managers. CANADIAN MACHINERY *advertisements have proven of great worth to Canadian engineers. Our advertisers recognize this and prepare their messages accordingly. Keep thoroughly up-to-date by studying BOTH editorial and advertising pages.*

Canadian Machinery and Manufacturing News, June 5th, 1919. Vol. 21, No 23. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.



Quality

Service

REASON IT OUT

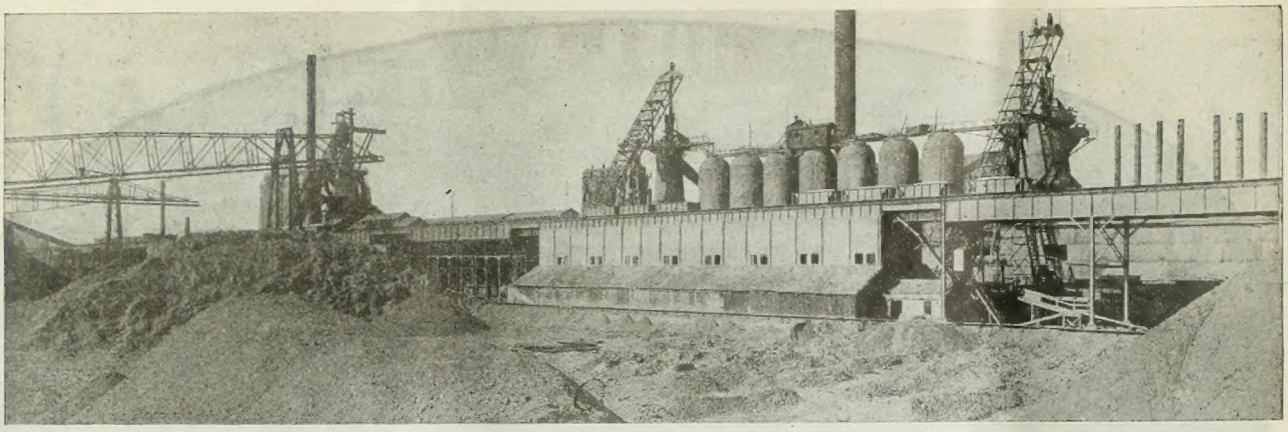
Demand full value for every dollar by spending it where you earn it

PURCHASE THE PRODUCTS OF CANADIAN MILLS

A Canadian Dollar is Worth One Hundred Cents in Canada

THE STEEL COMPANY OF CANADA LIMITED

HAMILTON MONTREAL



Algoma Steel Corporation LIMITED

Sault Ste. Marie, Ontario.

STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs to 100 lbs per yard)

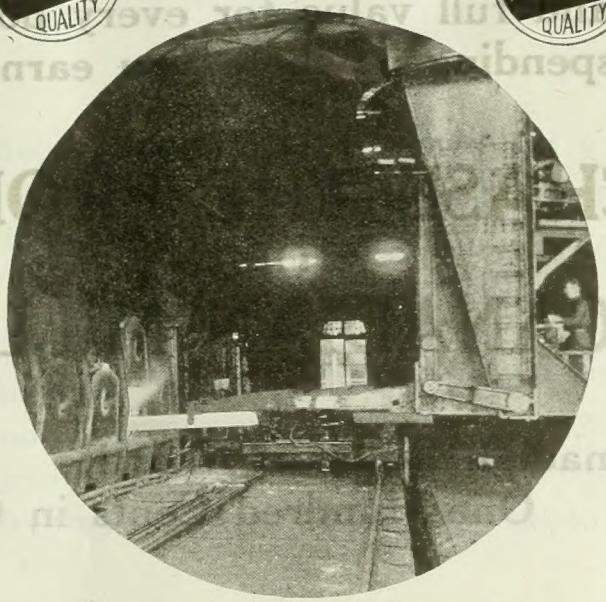
SPLICE BARS

STEEL TIE PLATES

PIG IRON
BASIC, FOUNDRY-BESSEMER

SULPHATE OF AMMONIA

MARK OF ALGOMA O.H. QUALITY



Charging and Withdrawing Crane

Sulphuric Acid. *Nitre Cake*

MARK OF ALGOMA O.H. QUALITY

BLOOMS,
BILLETS,
SLABS,
STRUCTURAL STEEL

MERCHANT BARS

CONCRETE REINFORCING BARS

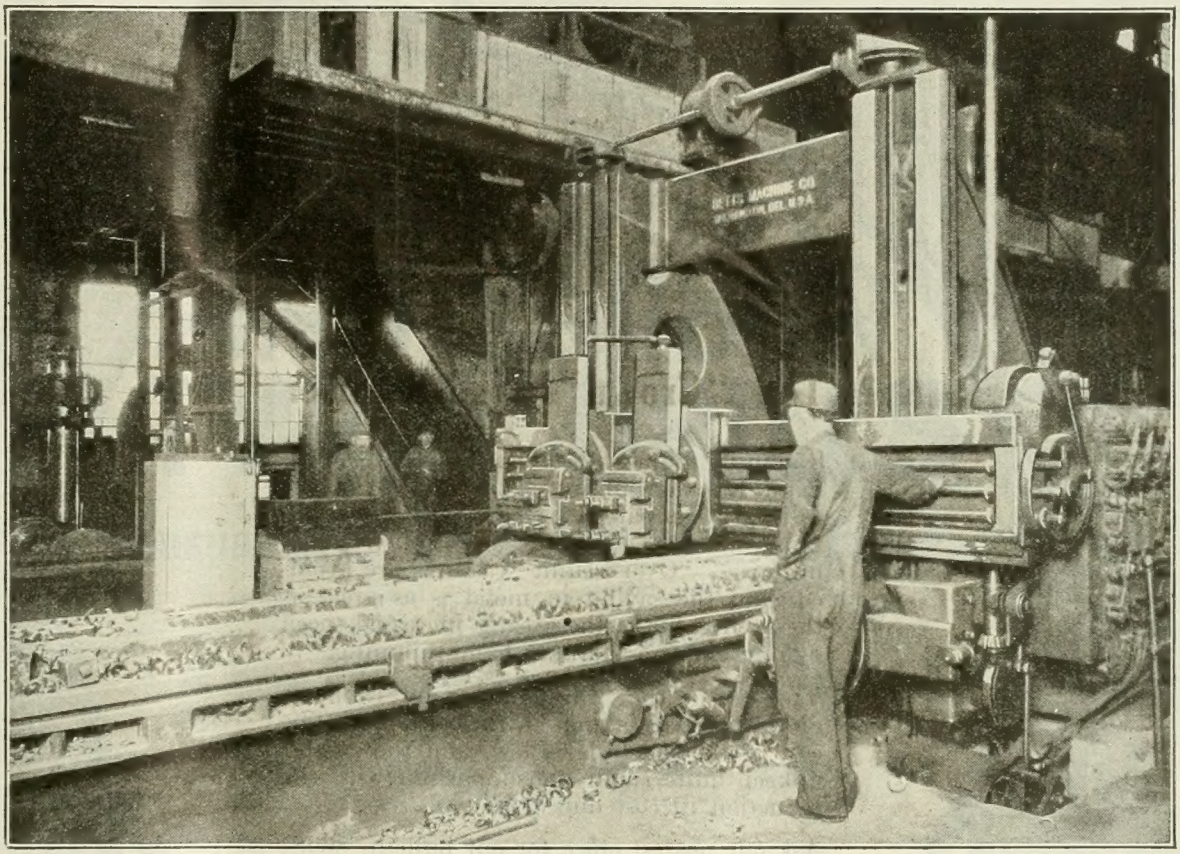
IRON, BRASS AND BRONZE CASTINGS



GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT

BETTS

Taking Two Cuts 1 Inch Deep with 1/4 Inch Feed in High Carbon Steel



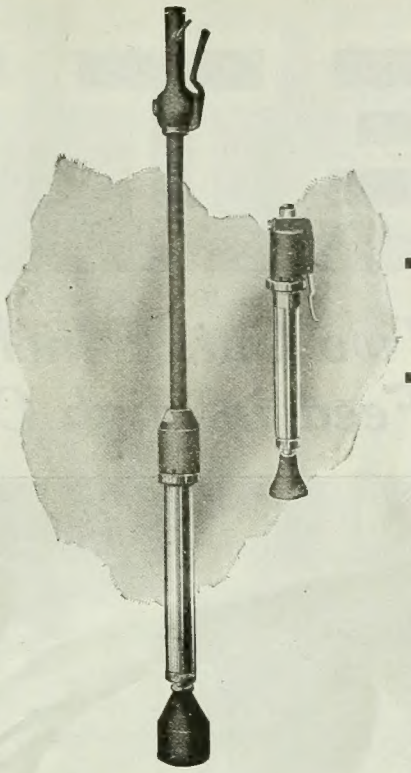
Planing steel trailer frames, taking two 1-in. cuts with ¼-in. feed at a cutting speed of 30 feet per minute in tough high carbon steel, would strain or break down an ordinary planer.

This Betts Planer in one of the leading locomotive works takes cuts like these as a matter of routine and is running night and day without trouble or repairs.

Service like this is possible on a Betts because of their exceedingly heavy construction—steel gearing throughout—steel rack—bronze bushings—extra heavy cross rails and uprights—heavy box type table and other features of the Betts standard of world leadership.

When you think of planers, think of Betts Planers. Specifications, quotations, etc., on request.

BETTS MACHINE CO.
408 Blossom Rd. Rochester, N.Y.
Formerly of WILMINGTON. DEL.



The "Crown" Sand-Rammer

Ramming foundry flasks with the "CROWN" Sand Rammer improves the quality of the castings; compared to hand-work the ramming is much harder, and much more uniform. "Over-weight" castings are avoided, and the saving in metal is as great as the saving due to the greatly increased speed —four times as fast as hand-ramming.

The use of the "CROWN" Sand Rammer gives very real savings in the foundry. The cost of the machine is low, and the cost of upkeep quite small in comparison with the reduction in cost due to its use.

Ask our nearest office for our bulletin 8608; look over the table of results on page 3 and see what this tool has done for other foundries—and will do for you.

Canadian Ingersoll-Rand Company
Limited

Sydney Sherbrooke Montreal Toronto
Cobalt Winnipeg Nelson Vancouver

WILT

"Where there's a WILT—there's the Way"

HIGH SPEED AND CARBON TWIST DRILLS

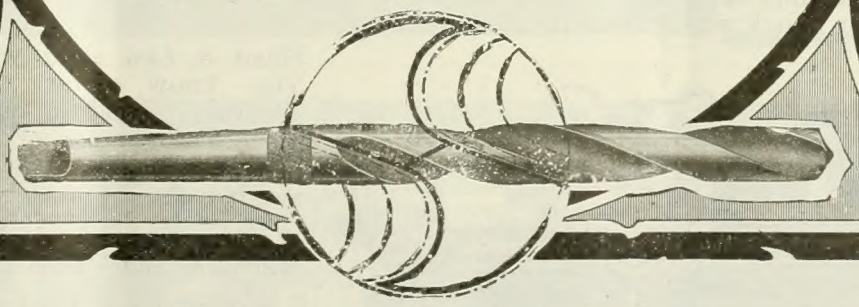
Unusual Drills Backed by Unusual Policies

Every superintendent should investigate the unusual qualities of

WILT TWIST DRILLS

The "WILT" has stood the test of all conditions—it is here to stay—its popularity among the mechanics makes that a certainty.

Investigate "WILT DRILLS" and you'll buy no others



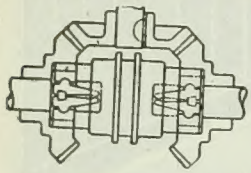
WILT TWIST DRILL CO.
OF CANADA, LIMITED

WALKERVILLE ∴ ∴ ∴ ∴ ONTARIO

London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, E.C. 2, London, England

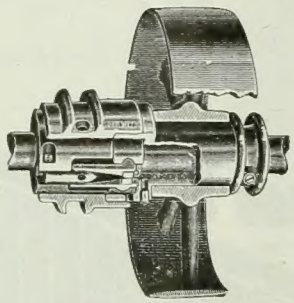
THE JOHNSON FRICTION CLUTCH

FOR SERVICE

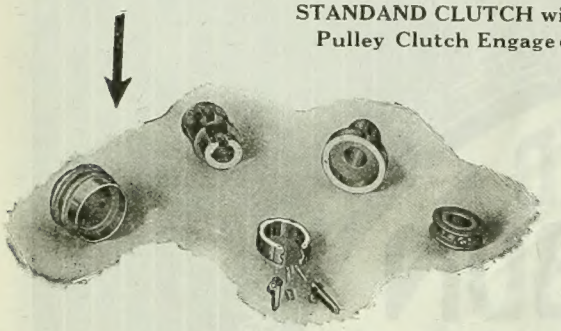


DOUBLE CLUTCH
IN NEST OF GEARING

Note the Parts of This Clutch



STANDAND CLUTCH with Pulley Clutch Engaged



The leading engineers are specifying *Johnson Friction Clutches.* Our years of experience in manufacturing friction clutches place us in an excellent position to take care of your requirements. The *Johnson Friction Clutch* has but few parts and is easily modified to meet any conditions. Have *you* noticed the concerns who are using *Johnson Friction Clutches?* There's a reason. Service is in back of it all. What are your requirements?

You Should Have Our Yellow Data Sheets and Booklet "Clutches As Applied in Machine Building"

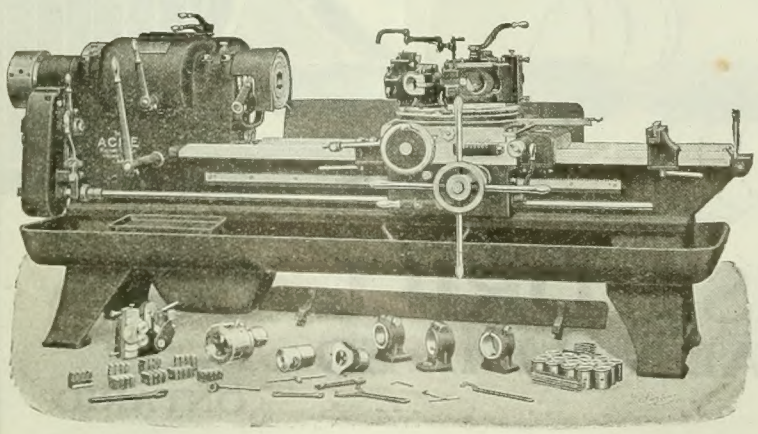
AGENTS: CANADA—Williams & Williams, 84 Inspector St., Montreal. The Canadian Fairbanks-Morse Co., Ltd., Montreal and Branches. ENGLAND—The Efandem Co., Ltd., 22 Newman St., Oxford St., London, W. 1, Sole Agents for British Isles. AUSTRALIA—Edwin Wood Pty., Hdwe. Chambers, 231 Elizabeth Street, Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3¼ in. x 36 in. Flat Turret Lathe, Equipped for Bar Work

Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spind'e with vees, upon which the turret carriage travels.

We also make a full line of Screw Machines and Turret Lathes.

Write for Valuable Bulletin

The Acme Machine Tool Co.

Cincinnati, Ohio

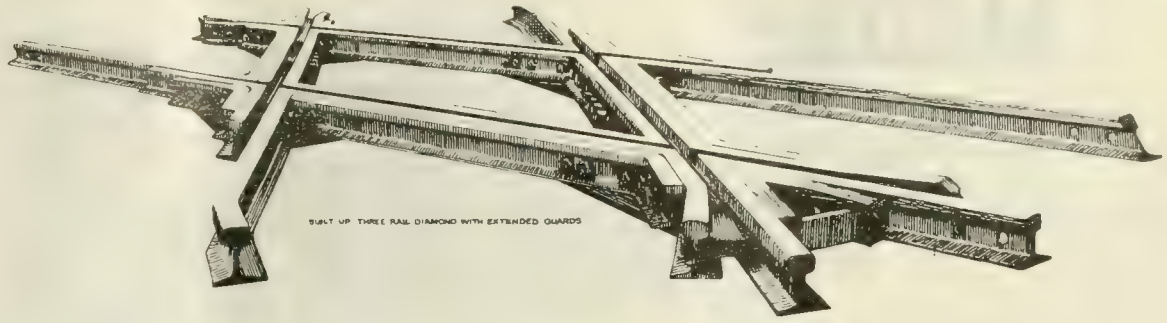
Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto

TRACKWORK

OF ALL KINDS FOR STEAM AND ELECTRIC RAILWAYS

Built-up, Hard-Centre and Solid Manganese-Steel

Manufacturers of Balkwill Articulated Cast Manganese Crossings



CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

H

Coal
Coke
Iron Ore



Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

M.A. HANNA & Co.

Sales Agents:
CLEVELAND
Canadian Office:
904 C.P.R. Bldg., Toronto

FIRTH'S Speedicut HIGH SPEED Steel

Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES | 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO

J. A. SHERWOOD
Canadian Manager

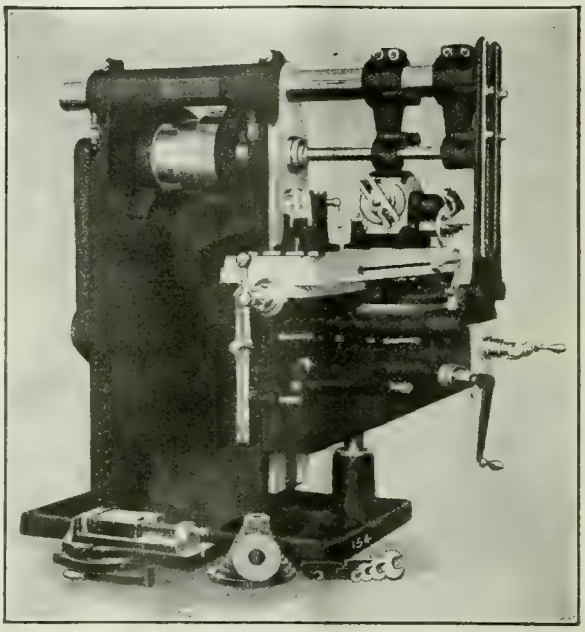
FORD-SMITH MILLERS

The Miller of high-grade construction — fast, accurate, and durable.

Immediate Delivery

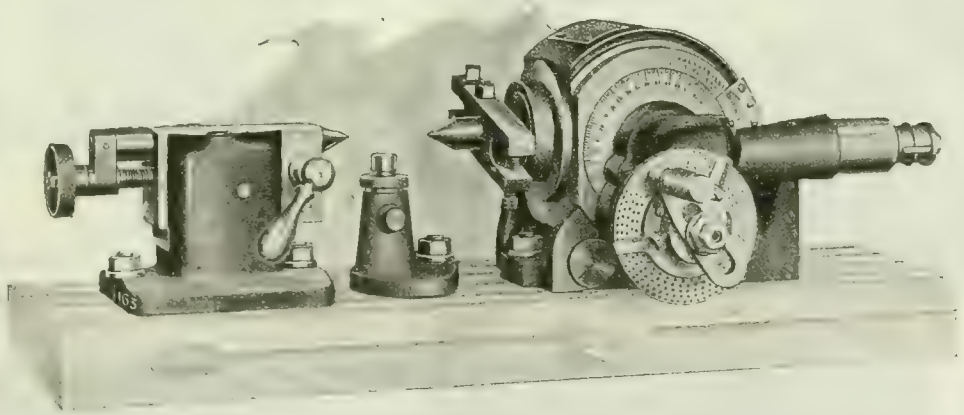
No. 2 Plain **No. 2 Universal**
No. 3 Plain **No. 3 Universal**

A Ford-Smith Miller is made for every requirement



No. 2 Full Universal

The Dividing Head



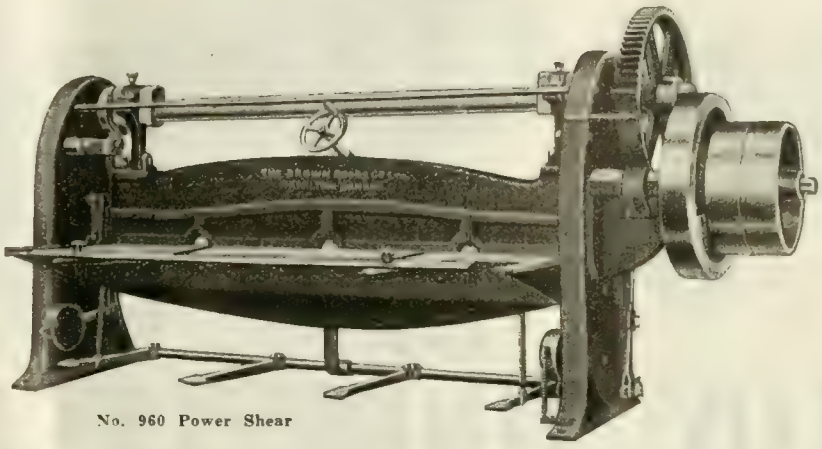
The care used in the building of Ford-Smith Dividing Heads is a fair gage of the workmanship in the entire machine. Each Head is thoroughly tested for accuracy so that every finished Head comes within the closest practice limits, giving satisfactory results.

Manufactured in Canada by

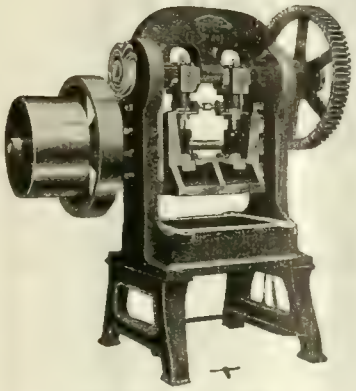
THE FORD-SMITH MACHINE CO., Limited
HAMILTON, CANADA

Foreign Agents: W. E. Storey, 3 Arundel St., LONDON, ENGLAND
Alf. Herbert, Ltd., 54 Dey St., NEW YORK, U.S.A.
Gollin & Co., MELBOURNE, AUSTRALIA

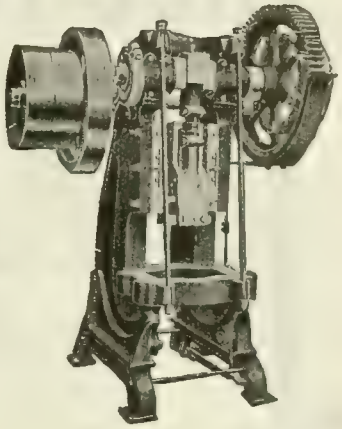
Stood The Test



No. 960 Power Shear



No. 20½ Power Press



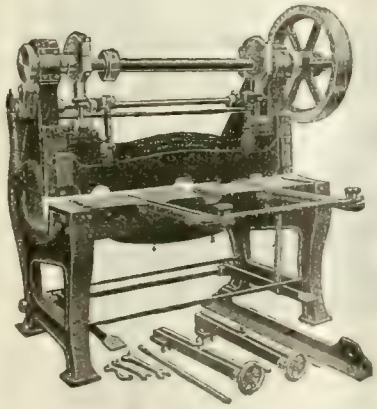
No. 215 Power Press

"B.B." Tools during the last four years have proven their superiority under the most trying conditions.

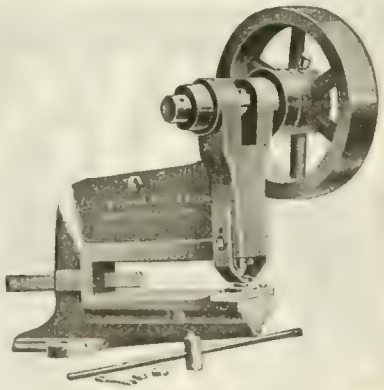
Inexperienced help and 24 hours' daily service will test the best machines.

Quality that is *"built in"* on a machine is bound to assert itself under such circumstances.

Our line comprises shears of all kinds, power presses for punching, forming, embossing, blanking, etc. Tinsmith's tools and sheet metal working machines of every description, also canners' and evaporators' machinery.



No. 404 Shear



No. 100 Power Punch

The Brown-Boggs Co., Limited

Hamilton, Canada

BRITAIN'S BEST

KE

BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

KE KELOCK

Principal TradeMarks

KAYSER ELLISON & Co LTD

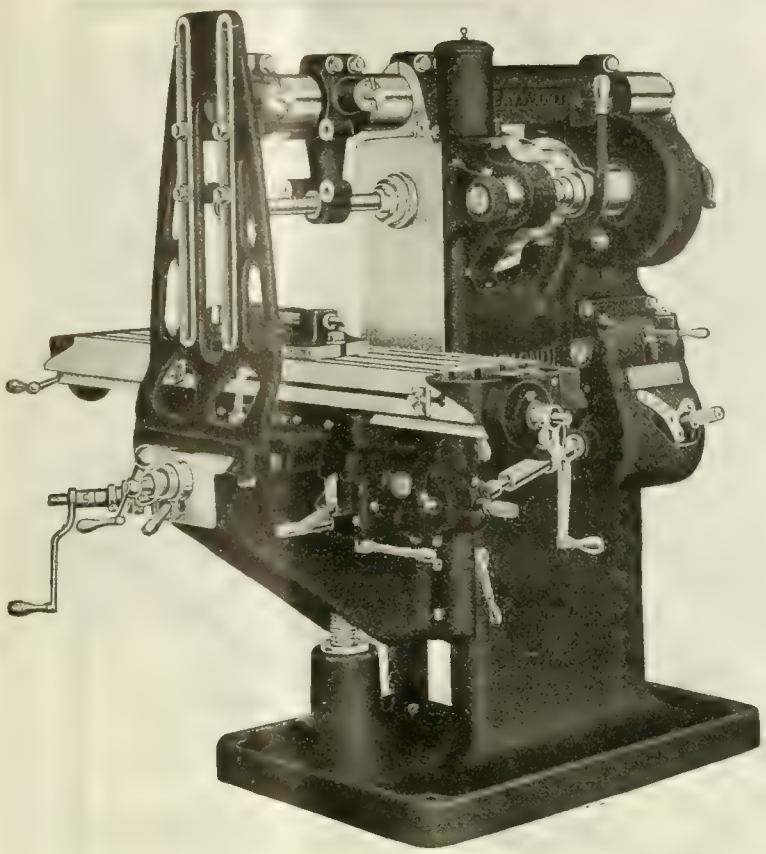
ESTABLISHED 1825 SHEFFIELD, ENG.

Complete Stock - Montreal Warehouse

RALPH B. NORTON

Agent

126 Craig St. West Montreal, Que.



LeBLOND

Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No. 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—

Hardened Steel Spindle Bearings—

Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents:

THE A. R. WILLIAMS MACHINERY CO., LIMITED
St. John, N.B. Montreal, P.Q. Toronto, Ont.
Winnipeg, Man. Vancouver, B.C.

LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH

OF CANADA, LIMITED

Head Office :
298-300 St. James Street,
Montreal

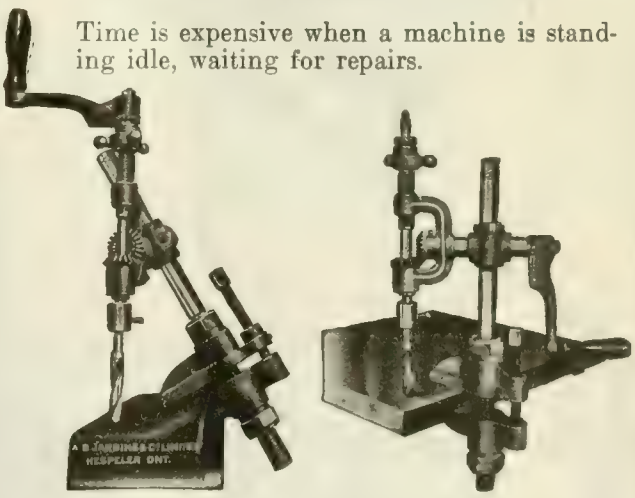
Works :
Longueuil, Que.

Branches :

126 Wellington St. W. TORONTO
27 King William St. HAMILTON
McArthur Building WINNIPEG

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



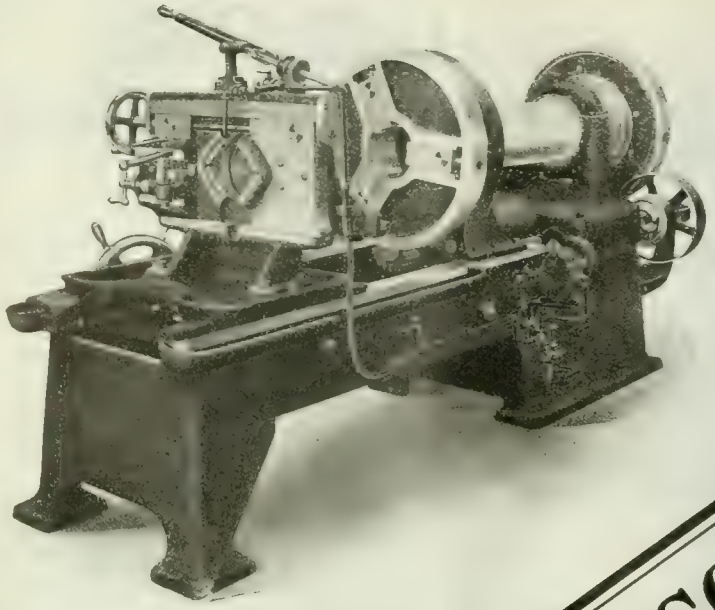
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net

Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited

HESPELER, ONTARIO

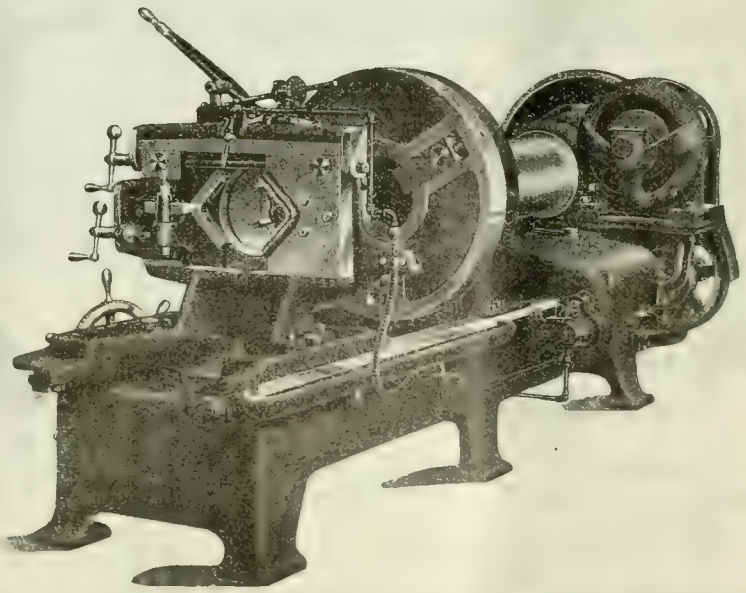


OUR SPECIALTY
PIPE MACHINERY

JOHN H. HALL & SONS, LIMITED
BRANTFORD, ONTARIO
MANUFACTURERS OF
Pipe Threading Machinery

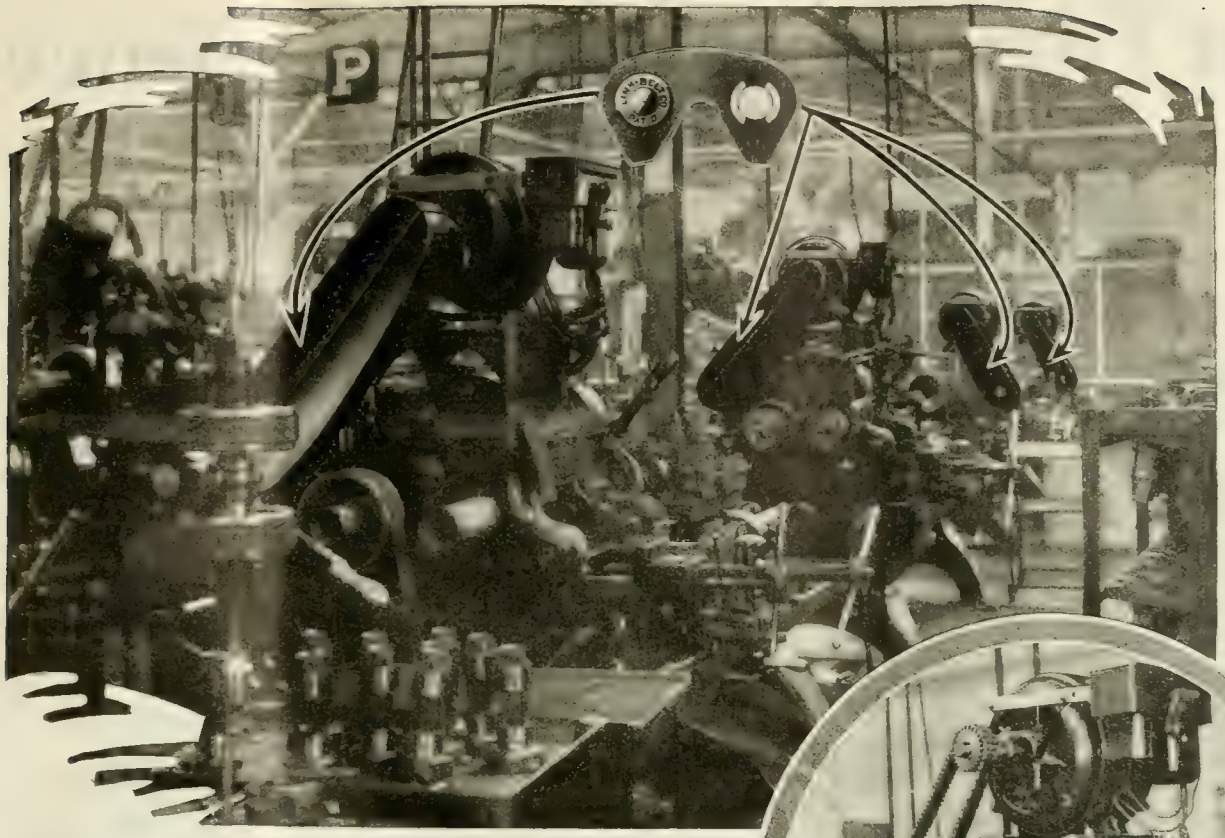
No. 6 Belt Drive
Capacity 1¼ to 6"
Built to
Last

All
Sizes
Pipe Machines
Nipple Machines
Roller Pipe Cutters



No. 8 Motor Drive
Capacity 2½ to 8"

Write for new
Descriptive Bulletins
Just Issued



Highly Important in Times of War Just as Important in Times of Peace

DURING the stress of war, when every machine in America was called upon to deliver to its utmost capacity, many machine tools were changed from belt to chain drive.

Reduced output due to slipping belts could not be tolerated. Each machine must produce during every second of the day. The time lost by slipping belts in the average plant soon runs into hours each day.

Link-Belt Silent Chain Drives did their bit to help win the war in thousands of machine shops. They are just as important in helping you increase your output and reduce your costs now in times of peace.

Remember, Link-Belt Silent Chain Drives are "flexible as a belt, positive as a gear, more efficient than either". The ideal drive for short centers. Permits any speed reduction. Improves finish of product. Allows convenient location of machines and driving parts.

Send for our 40 page Machine Tool Drive Book No. 312.

CANADIAN LINK-BELT COMPANY
LIMITED
WELLINGTON AND PETER STREETS
TORONTO

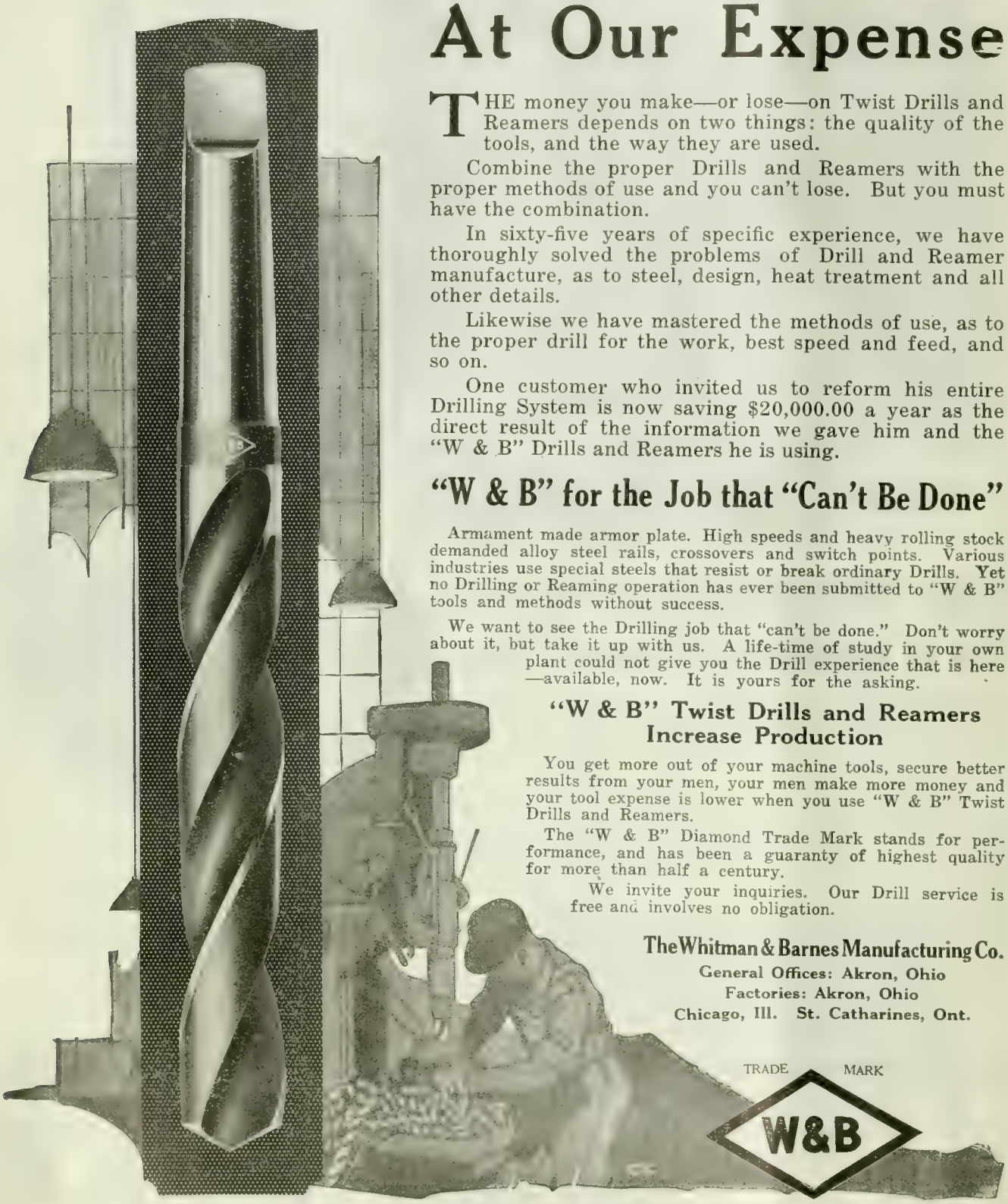
We Also Make

- ☐ Elevators and Conveyors
- ☐ Link-Belt and Sprockets
- ☐ Silent Chain Drives
- ☐ Truck and Tractor Chains
- ☐ Electric Hoists
- ☐ Locomotive Cranes
- ☐ Wagon Loaders
- ☐ Coal and Ashes Systems

Write for Catalogs
Place X in Square

LINK-BELT
SILENT CHAIN DRIVES

Get Your Twist Drill Experience At Our Expense



THE money you make—or lose—on Twist Drills and Reamers depends on two things: the quality of the tools, and the way they are used.

Combine the proper Drills and Reamers with the proper methods of use and you can't lose. But you must have the combination.

In sixty-five years of specific experience, we have thoroughly solved the problems of Drill and Reamer manufacture, as to steel, design, heat treatment and all other details.

Likewise we have mastered the methods of use, as to the proper drill for the work, best speed and feed, and so on.

One customer who invited us to reform his entire Drilling System is now saving $20,000.00 a year as the direct result of the information we gave him and the "W & B" Drills and Reamers he is using.

"W & B" for the Job that "Can't Be Done"

Armament made armor plate. High speeds and heavy rolling stock demanded alloy steel rails, crossovers and switch points. Various industries use special steels that resist or break ordinary Drills. Yet no Drilling or Reaming operation has ever been submitted to "W & B" tools and methods without success.

We want to see the Drilling job that "can't be done." Don't worry about it, but take it up with us. A life-time of study in your own plant could not give you the Drill experience that is here—available, now. It is yours for the asking.

"W & B" Twist Drills and Reamers Increase Production

You get more out of your machine tools, secure better results from your men, your men make more money and your tool expense is lower when you use "W & B" Twist Drills and Reamers.

The "W & B" Diamond Trade Mark stands for performance, and has been a guaranty of highest quality for more than half a century.

We invite your inquiries. Our Drill service is free and involves no obligation.

The Whitman & Barnes Manufacturing Co.
General Offices: Akron, Ohio
Factories: Akron, Ohio
Chicago, Ill. St. Catharines, Ont.

TRADE MARK
W&B

Established 65 Years
Whitman & Barnes
TWIST DRILLS — REAMERS — WRENCHES — HAMMERS

Tycos
TEMPERATURE INSTRUMENTS
Indicating Recording Controlling

Industrial Service

We supply special models of thermometers and temperature recording and controlling devices for upwards one hundred separate and distinct industries, all under our one general trade mark name of

Tycos

These models include many lines not coming strictly under the head of manufacturing, but rather under the broader classification of *industrial uses*.

Our facilities for the production of precise, reliable and permanent instruments are unequalled, while our staff of thermal engineers is thoroughly experienced in selecting proper and adequate apparatus for all industrial requirements.

Upon request we shall be glad to send you our catalogue covering your particular industry.

Taylor Instrument Companies
Rochester, N. Y.
There's a Tycos or Taylor Thermometer for Every Purpose
201 Royal Bank Bldg., Toronto 358

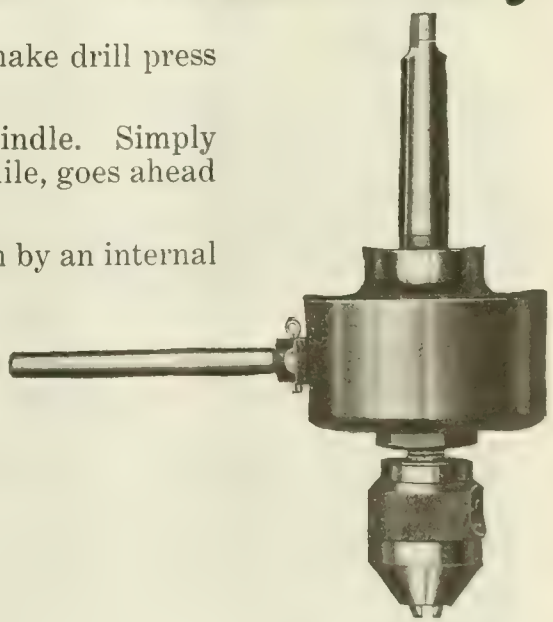
Save Taps, Trouble and Money

The "B-T" Reverse Tapping Attachment fits any make drill press and is equally efficient on **all** of them.

Eliminates necessity of reversing the machine spindle. Simply raising spindle reverses tap—the machine, meanwhile, goes ahead at full forward speed.

A reverse speed twice that of tapping speed is given by an internal gear drive. It is friction driven—automatically adjusted by the amount of pressure the operator puts on the drill spindle.

Can also be had with positive drive. Both plain and friction chucks are fitted with jaws to grip round and square end of tap.



Get the details—In our Bulletin.
Write to-day.

Bicknell Thomas Co.
Greenfield, Mass., U. S. A.

"B-T" Reverse Tapping Attachment

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Western Sales Offices:
Room 14 Windsor Hotel
MONTREAL



Steel Ingots
by the
HARMET
Liquid Process

One Customer says:

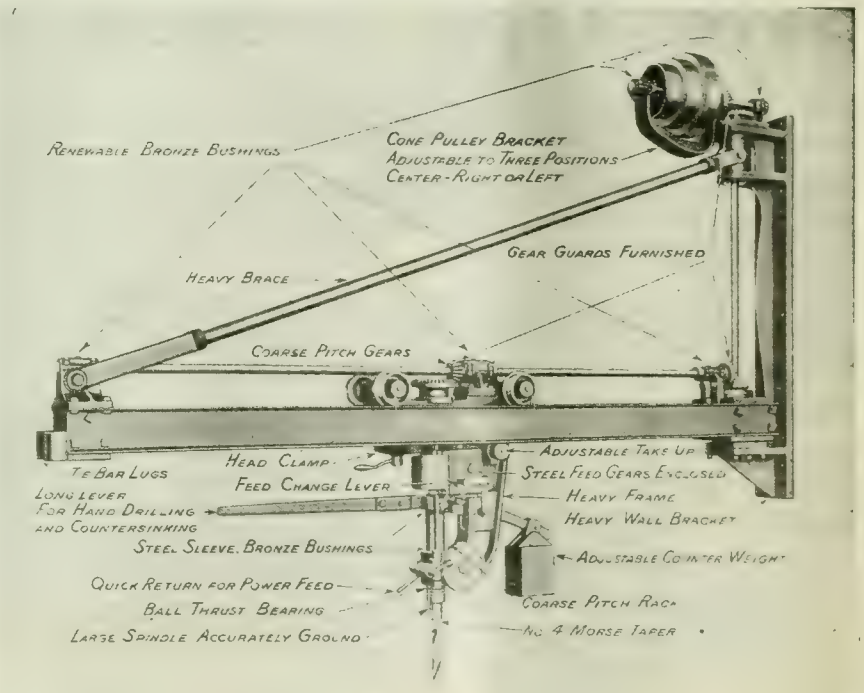
"These machines were put in operation immediately upon arrival, have been producing ten hours per day every day since, and we have never experienced a bit of trouble with same." We know you will appreciate what this means in any shop, and believe this is the sort of machine you are looking for. We consider the machine the finest in its line on the market to-day, and believe an installation would save money for you in the cost of your production.

Our illustrated bulletin will interest you, giving detailed information.

MADE IN FOUR STANDARD SIZES

Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**



HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.



Hoyt Metal Co., Toronto
New York, N.Y. London, Eng. St. Louis, Mo.

IMPERIAL GENUINE BABBITT METAL

The Highest Grade Manufactured

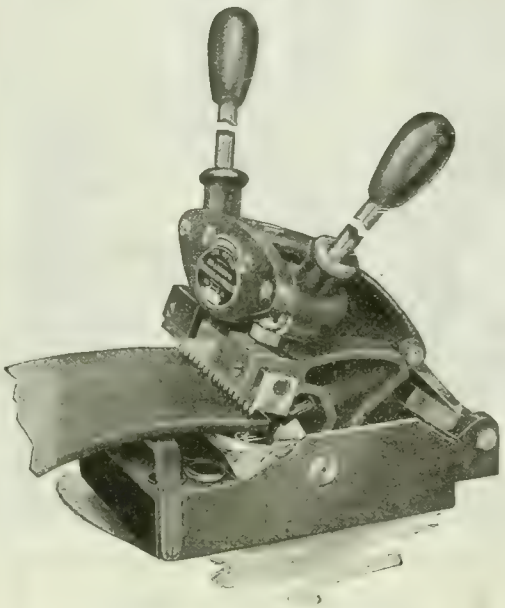


Made specially for all HIGH SPEED, HEAVY ENGINES and EXTRAORDINARY HARD WORK

Manufactured and guaranteed to give excellent service by
THE CANADA METAL COMPANY, Limited, FRASER AVENUE TORONTO, Hamilton, Montreal Winnipeg, Vancouver

Clipper
Clipper Belt Lacer Co.

An International Service To Industry



Year after year the simplicity and economy and effectiveness of the Clipper Belt Lacer have commended it to more plant managers, until now it is a recognized international service to industry.

It took the test of a period of extraordinary production to demonstrate to the industrial world its unlimited possibilities. Whatever the demands, in a hundred thousand plants in all countries during recent strenuous manufacturing days, the Clipper met the call with amazing speed and efficiency. The old slow methods of lacing broken belts are too expensive for any plant.

The Clipper Belt Lacer
Laces a Belt in Three Minutes

It not only does the job quickly but does it well. It repairs a belt permanently—makes it stronger than before the break.

The Clipper lacing tool is so simple that shop workmen use it with ease. No experts required. No delays. No shut-downs. The cost of repairing a joint with the Clipper is small.

Many plants have increased the efficiency of Clipper Belt Lacing Service by keeping Clipper tools convenient to every battery of machines for emergency use when a belt breaks.

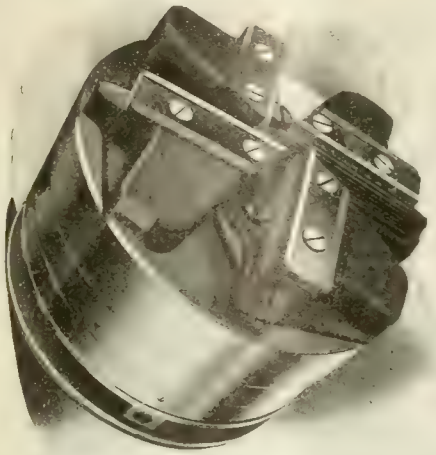
The American Museum of Safety expressed its opinion of the Clipper Belt Lacer by awarding it the only medal ever given for metal lacing.

The Clipper Belt Lacer is recommended with confidence to manufacturers who have had unsatisfactory belt lacing. The Clipper goes to them on free trial and is backed by a permanent guarantee.



Mill supply houses everywhere sell the Clipper. European trade supplied through London, England, office, No. 10 Norfolk St. Distributors in all parts of the world

Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U. S. A.



Sure, We'll Be There

Spaces 131 and 133 Machinery Hall
Young's Million Dollar Pier
Atlantic City, N.J.
June 18th to 25th

The Landis Machine Company will exhibit their line of Bolt and Pipe Threading Machines at the M.M. & M.C.B. Convention at Atlantic City, June 18th to 25th.

Daily demonstrations will be given with a 2" Double Bolt Threading Machine and a 4" Pipe Threading and Cutting Machine. There will also be shown Stationary Die Heads, Chaser Grinder and the **NEW AUTOMATIC DIE HEAD.**

You are cordially invited to visit their booth, Spaces 131 and 133, and investigate the Landis Die. It will be worth while to those interested in thread cutting.

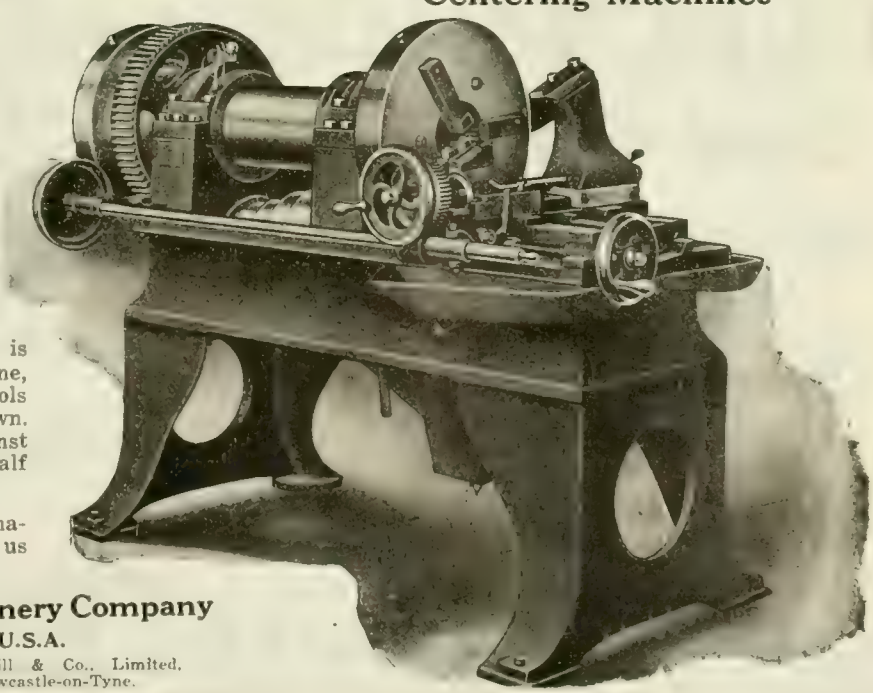
LANDIS MACHINE COMPANY
WAYNESBORO, PA.

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines

TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.



Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company
South Sudbury, Mass., U.S.A.

Foreign Agents: England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.



Williams' "Vulcan" Drop-Forged Safety Lathe Dogs

"THEY SERVE WITH SAFETY"

PROVIDE safety for the operator and increased profit for the manufacturer—safety that is sure and unqualified, because automatic; increased profit, because, with all fear of danger eliminated, the operator is free to devote his attention to *production* only. That is one of their strong points.

They are built for a lifetime of hard, continuous service for they are the result of nearly half a century of experience in designing and making *Superior* drop-forged tools. Bent and Straight Tail patterns, with 1 or 2 screws, 16 sizes, 3/8" to 6", maximum capacities.

BOOKLET ON REQUEST

J. H. Williams & Co.

"The Drop-Forging People"

45 Richards Street, Brooklyn, New York

THE A. G. LOW CO., LTD.
45 Pacific Avenue, Saskatoon, Sask.
Agents for Manitoba, Saskatchewan, British Columbia and Alberta.

E S&M

ELECTRIC Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED
WELLAND ONTARIO

G G

Forging Billets and Bars

Electric Furnace, Alloy Steels

Die Blocks
Annealed—Heat Treated

Piston Rods
Rough Turned—Annealed—Heat Treated

High Speed Steel

General Steel Company

Milwaukee, Wisconsin
DETROIT—823 Dime Bank Building



"Saves us 75%"

This Advertisement is one of a series based on actual occurrences

"That's what this OAKITE cutting compound does for us.

"We make it up with Oakite and it costs just one-fourth of what our old cutting oil used to cost.

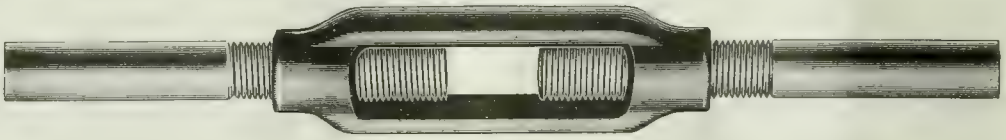
"With this Oakite cutting compound we get a finer cut, our tools keep cooler and do not have to be sharpened so often—and the work does not rust.

"And say, the men like it fine! It keeps their clothes and hands cleaner and does not make sores on their arms like the old oil did."

OAKITE MANUFACTURED BY
OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK

CANADA
FOUNDRIES & FORGINGS
LIMITED

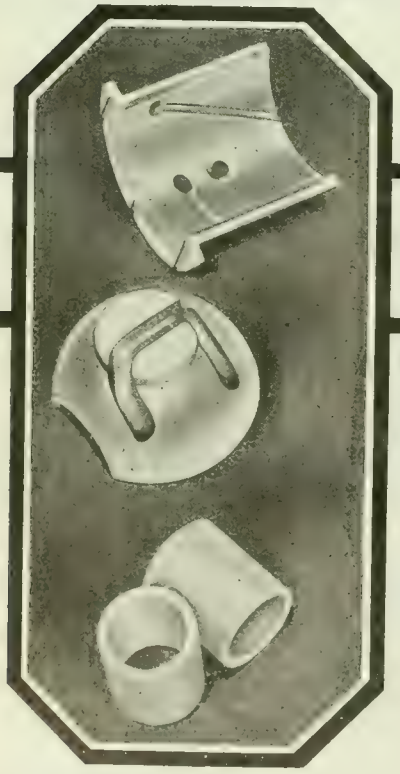
DROP FORGED STEEL



STANDARD TURNBUCKLES
18 Sizes, with or without Stubs

Prompt Service

Canadian Billings & Spencer Plant
Welland, Canada



FRANKLIN
DIE-CASTINGS

And Their Relation To Your Product

There is no question regarding the advantage of die-castings. If properly applied, they are more economical and more practical than machined parts.

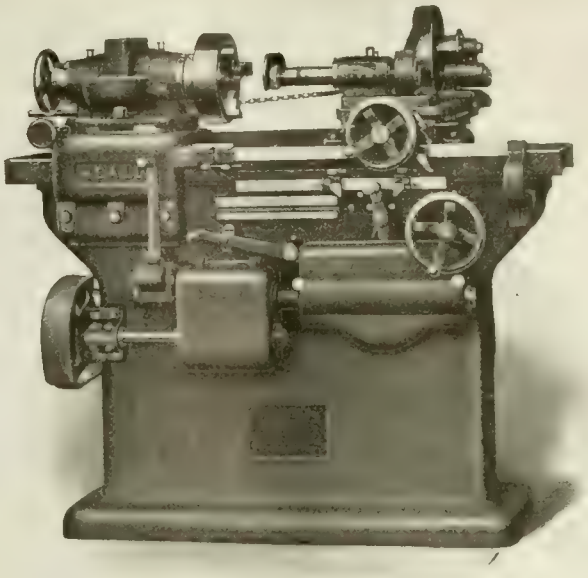
We can help you decide their proper application to your product. Help you—because we not only originated the die-casting process but have had 27 years' continuous experience and study in perfecting it.

Many times we have overcome problems which have baffled others.

Ask for a representative to call, or send sample of blue print for recommendation and estimate. Booklet "C" will be sent upon request.

FRANKLIN MANUFACTURING COMPANY
746 GIFFORD STREET, SYRACUSE, NEW YORK, U.S.A.

A REAL INTERNAL GRINDER



A few of the features:

FLEXIBLE IDLER WHEEL DRIVE greatly increases the life of the bearings.

AUTOMATIC WHEEL GUARD absolutely protects the operator when chucking or gauging the work.

HEAD STOCK is very massive and has swivel adjustment. Notice it is connected directly to the base, absorbing all vibration.

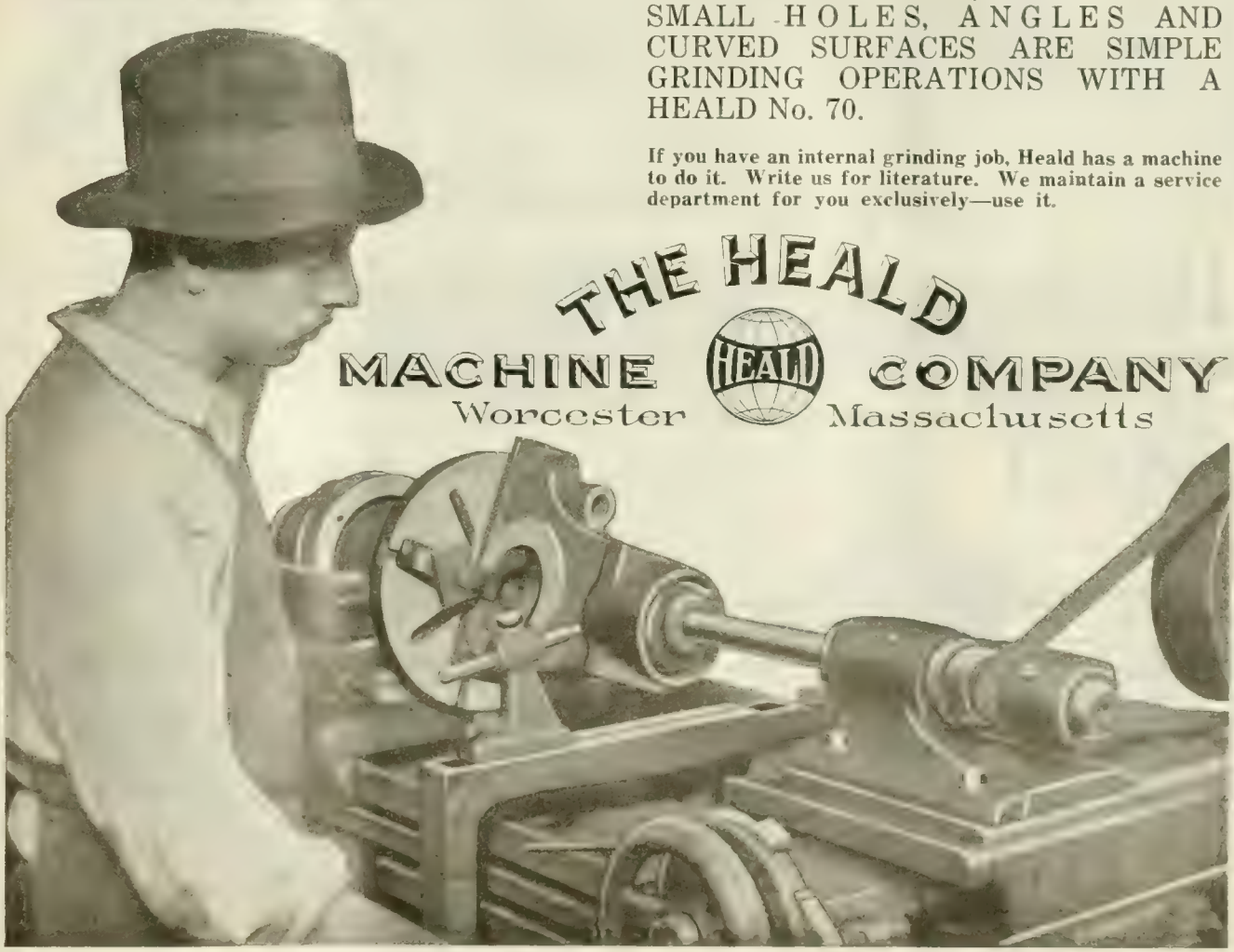
TABLE AND WORK SPEEDS are instantly available.

WHEELHEADS are made up in units and are instantly interchangeable. Correct spindle speed is obtained as the spindle pulley is part of the unit.

WHILE IT IS PRIMARILY A PRODUCTION MACHINE, LARGE OR SMALL HOLES, ANGLES AND CURVED SURFACES ARE SIMPLE GRINDING OPERATIONS WITH A HEALD No. 70.

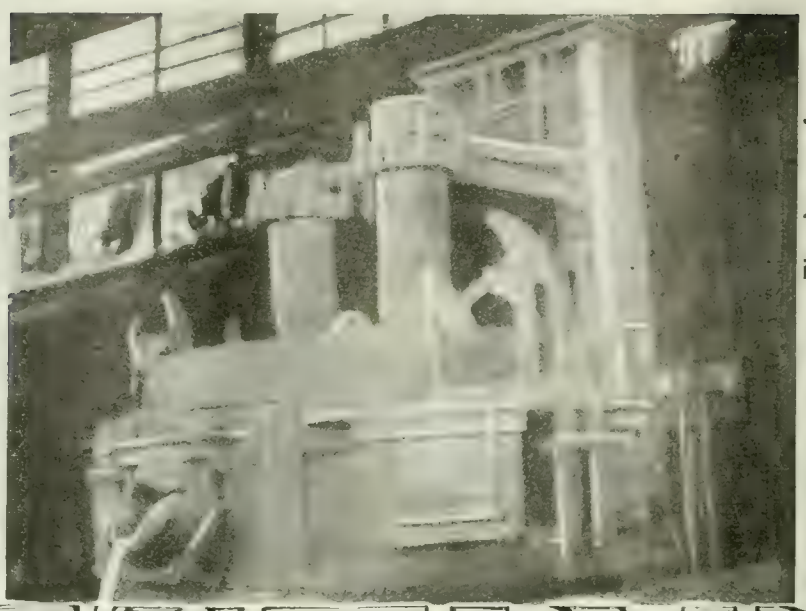
If you have an internal grinding job, Heald has a machine to do it. Write us for literature. We maintain a service department for you exclusively—use it.

Below is shown an awkward-shaped cylinder being ground at the Bourke Machine Co., Detroit, Michigan. All that was necessary was to center and strap it to a standard face plate.



THE HEALD MACHINE COMPANY

Worcester Massachusetts



ELECTRITE

High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces—entirely infallible, automatically regulated, delivering the same result time after time.

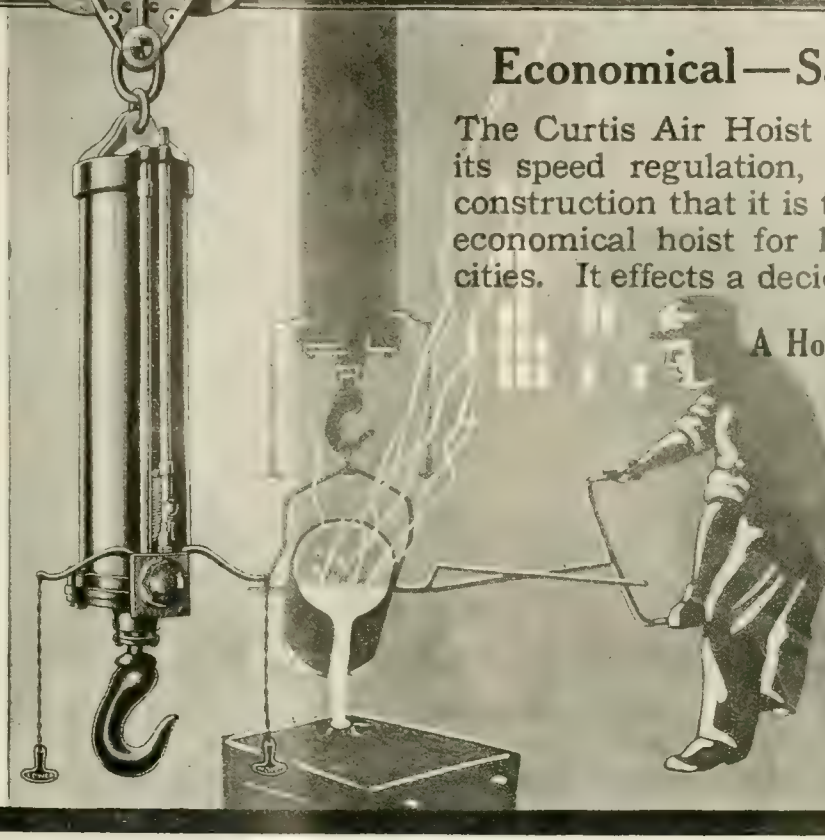
Uranium—This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN.

URANIUM

CURTIS *Air Hoists*



Economical—Safe—Dependable

The Curtis Air Hoist has been so perfected in its speed regulation, design and mechanical construction that it is the simplest, safest, most economical hoist for light and medium capacities. It effects a decided saving in man power.

A Hoist to Meet Your Needs

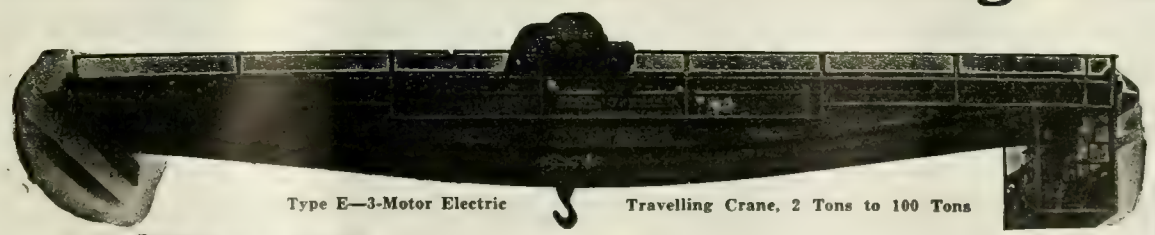
CURTIS AIR HOISTS have been successfully adapted to meet a wide variety of needs in hundreds of the leading industrial plants throughout America.

Our Engineering Department is at your service, ready to study any special conditions you have to meet and recommend suitable equipment. Illustrated descriptive literature and full information on request.

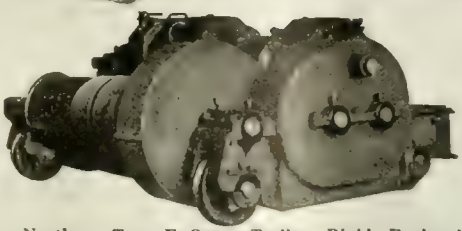
Curtis Pneumatic Machinery Co.
1585 Kienlen Ave., St. Louis, Mo.
Branch Office—532-A Hudson Terminal, N.Y.C.

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

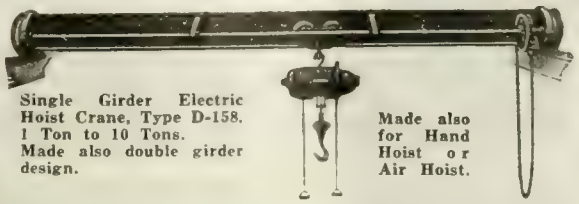


Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

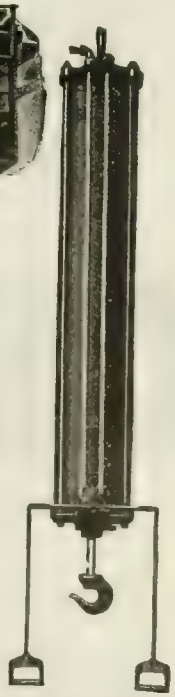
Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists —½ to 10 Tons. Air Hoists, Trolleys and Tracks.



Type No. 20 Air Hoist.

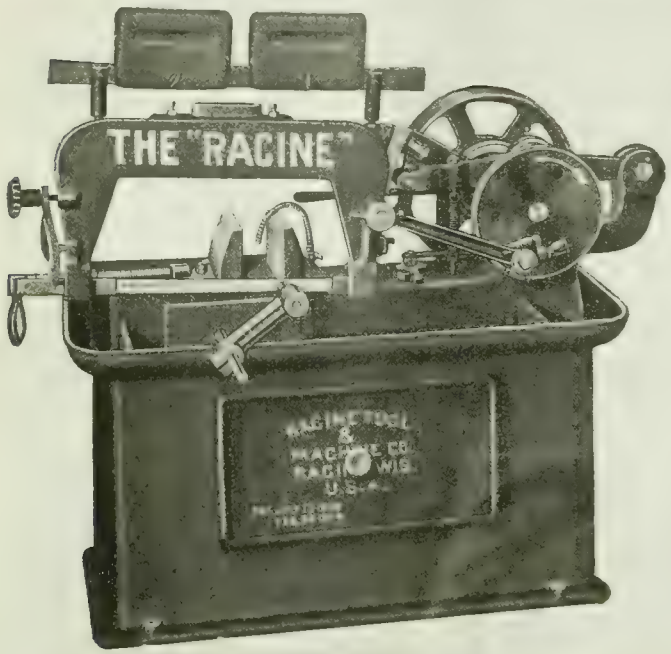
Northern Crane Works, Limited

Walkerville, Ontario, Canada

Standard the World over

"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE



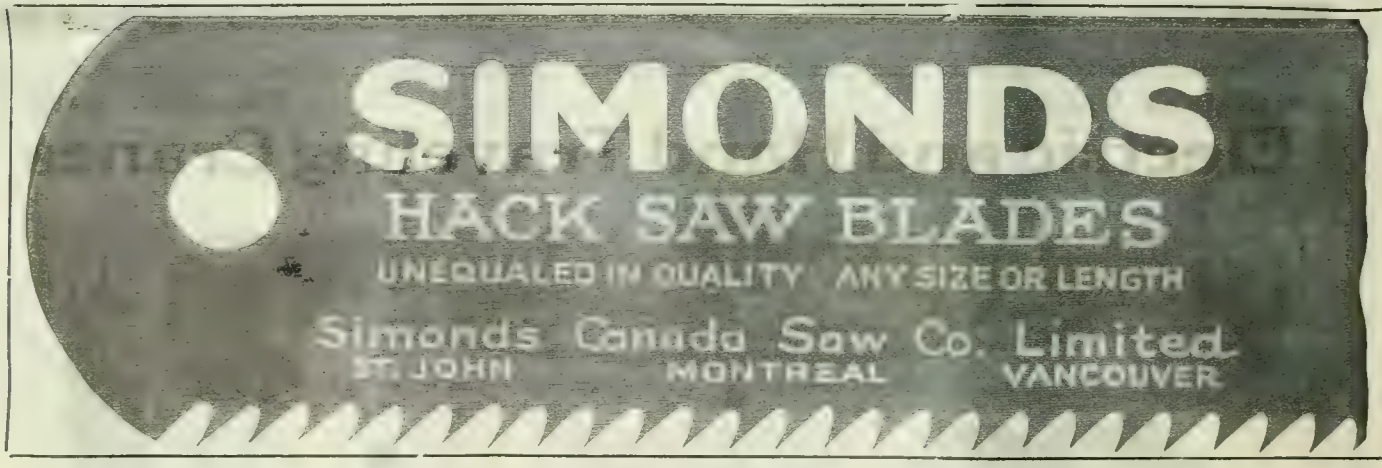
Reduces Blade Expense

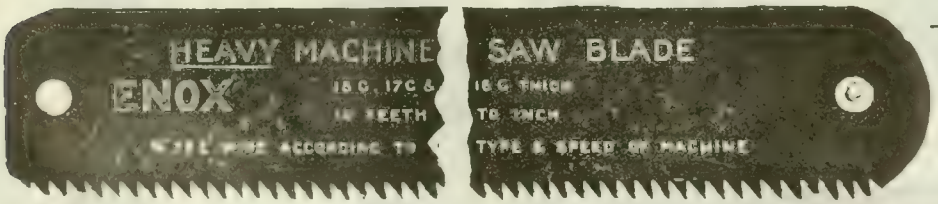
Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

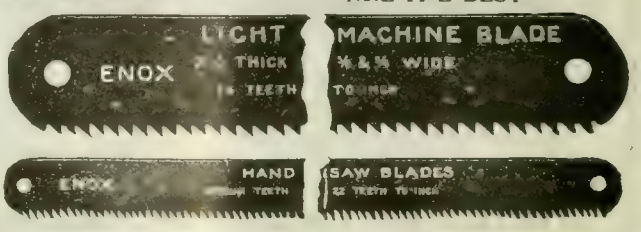
Use "Racine" H. S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Ave., RACINE, WIS., U.S.A.





ENOX
Hacksaw Blades
ARE THE BEST



AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

Makers:

FRY'S (LONDON) LIMITED

AN ENTIRELY BRITISH COMPANY

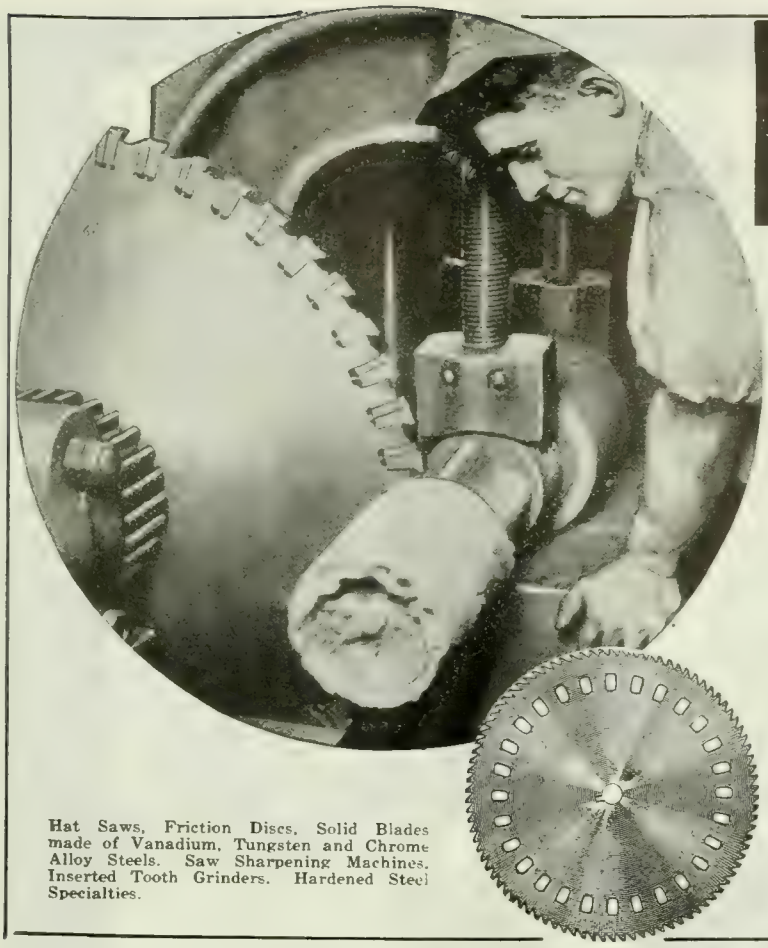
46 Upper Thames St., London, E.C. 4, England. Works': Greenwich, S.E. 10

Agents for Canada, East of Fort William

THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Limited, 495 Railway St., Vancouver, B.C.


Starrett Tools
Are known to mechanics as the best tools for precision measurements that mechanical skill can produce or that money can buy. The accuracy, simplicity and sterling quality of the Starrett Micrometer has won it a place in the personal kit of almost every machinist.
A copy of catalog No. 213 descriptive of 2,100 kinds and sizes of tools will be sent you free on request.
THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled
Athol, Mass.
STARRETT TOOLS



Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

"STERLING"
HACK SAW BLADES



A brand once adopted, difficult to replace.

REASONS—High quality of material used, mechanical construction, and special heat treatment.

RESULTS—Economy, which means satisfied customers.

Write for Information and Prices

DIAMOND SAW & STAMPING WORKS
BUFFALO, N.Y., U.S.A.



CUT YOUR CUTTING COST WITH VICTOR Flexibles

The high cost of tools should emphasize more than ever the importance of quality.

The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA



STOCO "CELOGLAS"

SHATTER-PROOF LENS

SAFETY GOGGLES

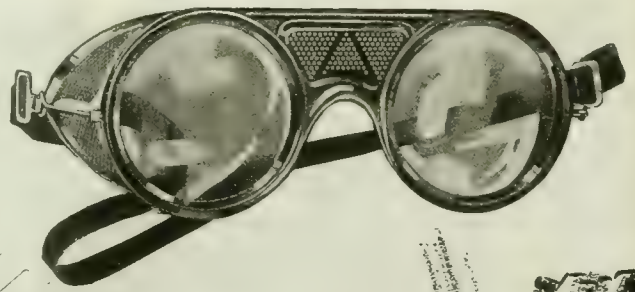
ADEQUATE eye protection not only preserves eyesight under hazardous conditions, but also makes your men better workmen. The man who is constantly dodging, or fearing eye injury, is not a competent workman.

Stoco safety goggles with Celoglas shatter-proof lenses are the best possible eye protection. The frame itself is light in weight and comfortable, but very strong. Celoglas lenses, even when fractured, will not leave the frame or pieces fly into the eyes of the wearer.

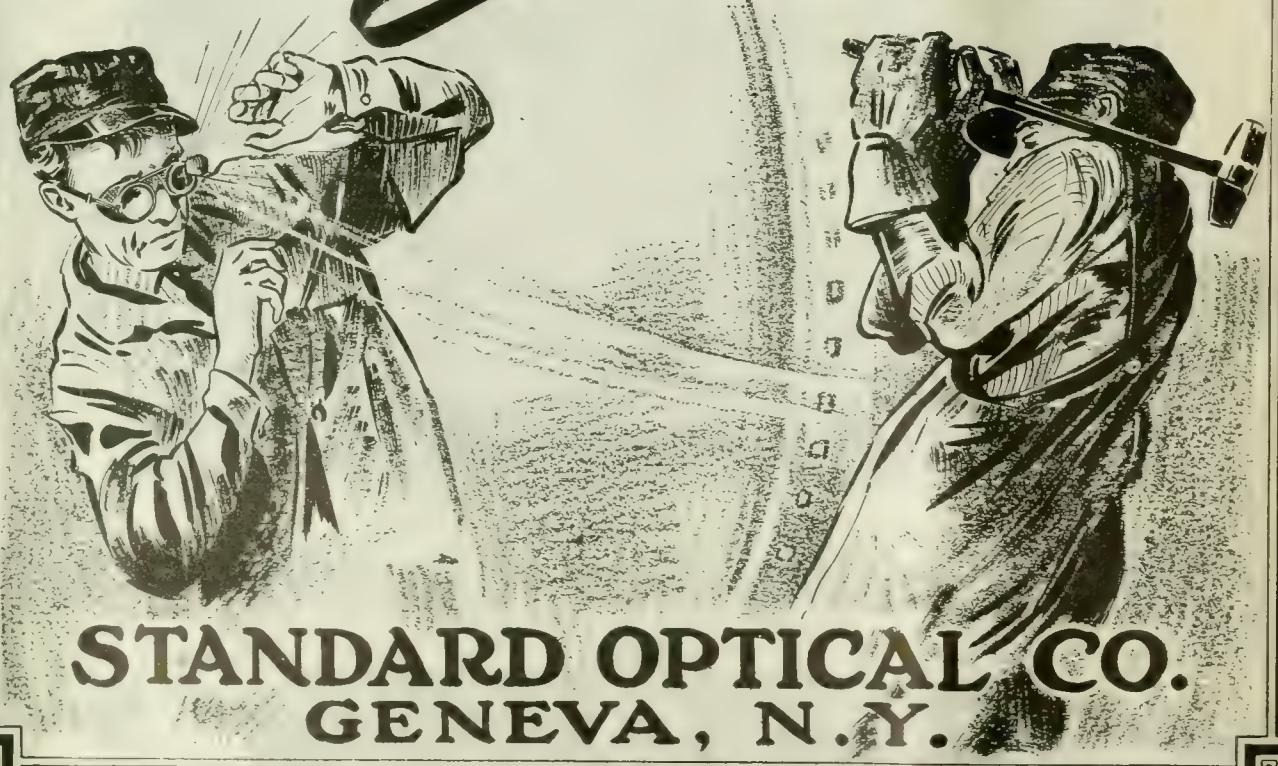
Made with elastic headbands as illustrated or with easy cable ear-bows at the same price.

Stoco safety goggles with Celoglas lenses, $1.50 per hundred pairs.

With regular heavy weight optical glass lenses, $1.15 per hundred pairs.

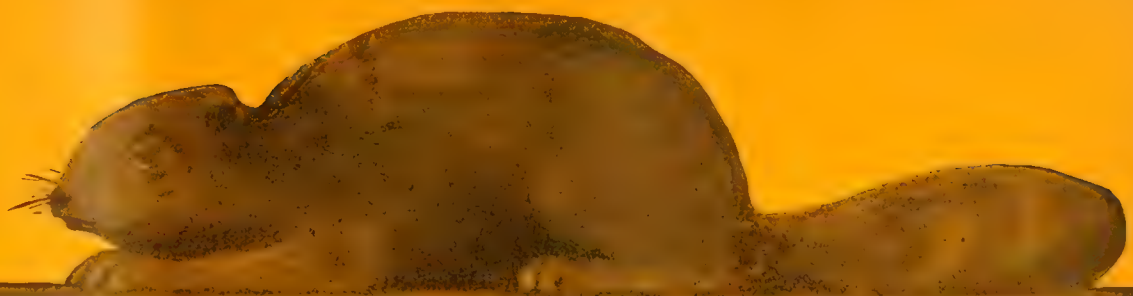


You are invited to test the Stoco goggles without expense or obligation. A sample will be sent free on request to any Superintendent, Safety Engineer or Purchasing Agent.



STANDARD OPTICAL CO.

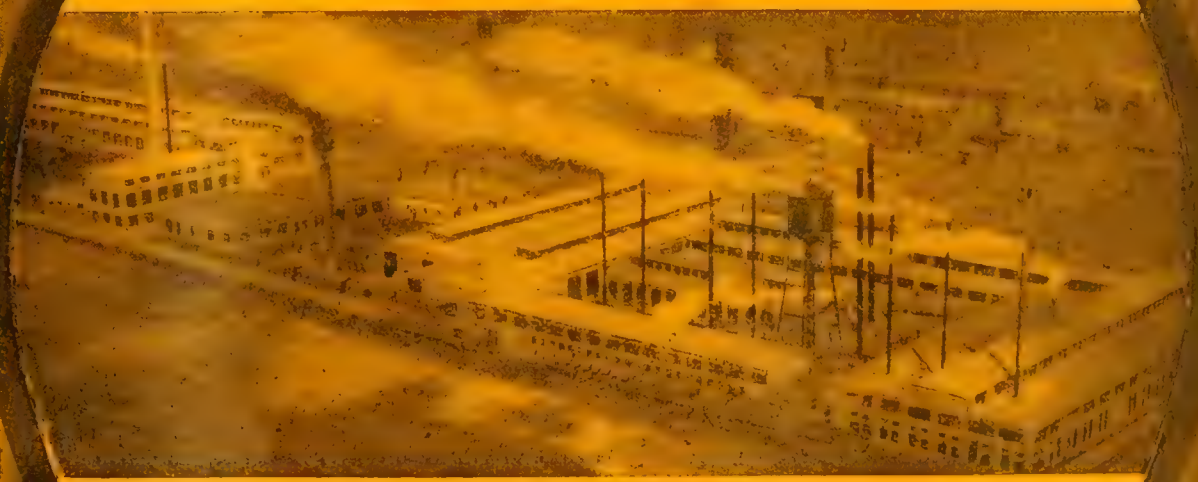
GENEVA, N.Y.



BROWN'S

Beaver Brand Metals

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in sheets, rolls, plates and rods. Naval Bronze, Yellow Metal and Muntz Metal in sheets and rods for shipbuilding requirements. Specify Beaver Brass Rod for drilling and free cutting. Extruded shapes.



Guaranteed Ingot Metals—Yellow, Red and Composition Ingots.
We are Purchasers of Copper Bearing Material.

Link up with Beaver Brand Products—you'll like the quality, price and service.

Brown's Copper & Brass Rolling Mills, Limited

New Toronto, Ont., Can.

COPPER & BRASS BROWN'S QUALITY ROLLING MILLS

MALLEABLE AND CAST IRON PIPE FITTINGS

IM

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy—"the brand that has the quality." They are different. A trial order will convince.

International
Malleable Iron Company, Limited
Guelph, Ontario, Canada



Spot-Facing 20,400 Holes a Day

That is the output of this NATCO Multi-Driller. The proof is in the plant of the Lincoln Motor Co., Detroit, where many of these NATCO No. 32 machines are being used on Liberty Crank Cases. The NATCO shown above is in the act of spot-facing 68 holes of two sizes—50 holes 25/64 inch diameter and 18 holes 9/32 inch diameter.

A few weeks ago we showed how the NATCO No. 30 drilled 71 holes of varying diameters into the upper half of these Liberty Motor Crank Cases. The exclusive NATCO patented feature—**Independent Change of Speed for each Spindle**—provides the proper speed for each cutting tool and makes possible the drilling, reaming, tapping, spotfacing, etc., of many different sized holes in one operation.

NATCO Multi-Drillers are built in sizes suitable for every purpose—from 2 spindle types to machines containing 72 spindles.

LET US MAKE YOU PRODUCTION ESTIMATES

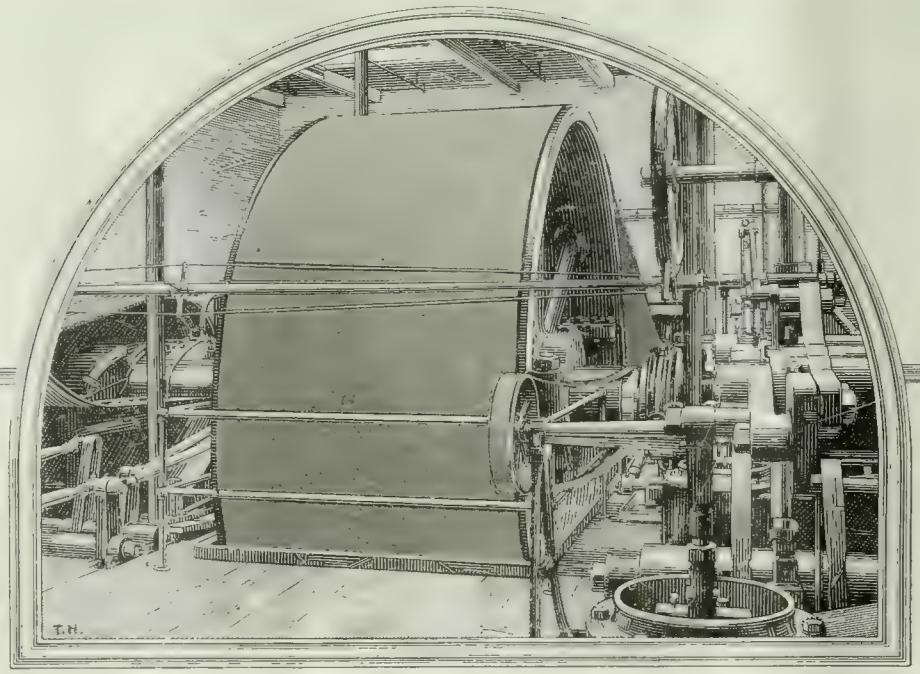
The National Automatic Tool Co.
Richmond Indiana, U. S. A.

NATCO

Foreign Agents:
Burton, Griffiths & Co., British Isles.
E. Isbecque & Co., Belgium;

CANADIAN AGENTS
The A. R. WILLIAMS MACHINERY COMPANY, LIMITED
TORONTO, MONTREAL, WINNIPEG, VANCOUVER, HALIFAX, ST JOHN, N B. BUFFALO

Foreign Agents:
Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland.
Aux Forges De Vulcain, France.



This is an 80-inch 3-ply Heart Brand Belt in a Massachusetts paper mill. It began its service in 1911. It carries 1,100 horse-power. The cost of transmitting a horse-power a week is $.0045.

The Test of Adaptability

For some materials there is no substitute. Such, for instance, is leather for belting. Its superiority for all the major requirements is recognized by transmission experts. The belt shown above, for instance, was transferred from one drive to another—lengthened by splicing, and cut down 2 inches in width—an adaptation that is possible only with leather.

The advantages of leather for transmission are developed to their maximum in Graton & Knight Standardized Series Leather Belts. They are that rare thing in business—a highest-quality line enjoying the largest sales. Do you know of any other brand in any highly competitive field that combines highest grade with biggest sale? Talk that over in your transmission conferences.

Write for booklet on standardization as applied to belting

THE GRATON & KNIGHT MFG. COMPANY

Worcester, Mass., U.S.A.

Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Packings, and Specialties

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Canadian Graton & Knight, Ltd., Montreal. Canadian Representatives: The Canadian Fairbanks-Morse Co., Ltd., St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria.

GRATON AND KNIGHT

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use

Nichrome Castings for Heat Treatment



At 1800 degrees Fahrenheit

Cast Nichrome Carbonizing Boxes Give Thousands of Hours of Service

Case hardening is easy, reliable, and economical because CAST NICHROME containers are

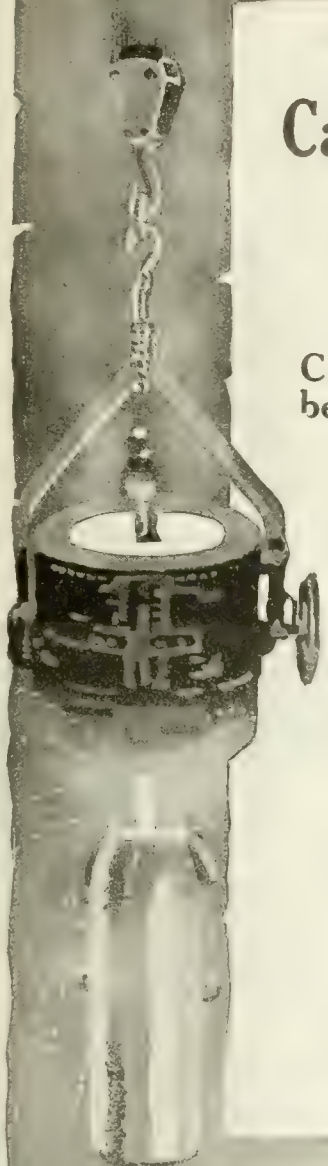
NON-CRACKING
NON-GROWING
NON-SCALING
NON-WARPING

Their heat conductivity is high, and their life is guaranteed.

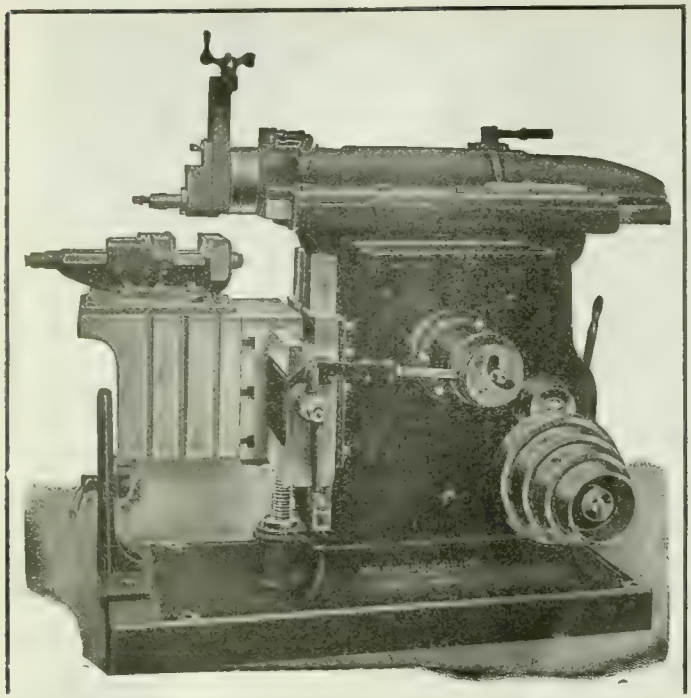
CANADIAN DRIVER-HARRIS CO., Ltd.
WALKERVILLE, ONT.
CANADA

CHICAGO
HARRISON N.J.
MANCHESTER

Manufactured under Henderson Patents







McDougall SHAPERS

Combine the best features of all machines which have hitherto been placed upon the market, and nothing has been included, except those points which experience has shown to be essential.

An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

ARE-MAC-DEE IS A GUARANTEE

MacKINNON STEEL CO., LTD.

Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

Prompt Deliveries Assured.

MacKINNON STEEL CO., LIMITED
Sherbrooke, Quebec
Montreal Office: 404 New Birks Building

Swedish Steel & Importing Co., Limited

Montreal Toronto
New York Denver

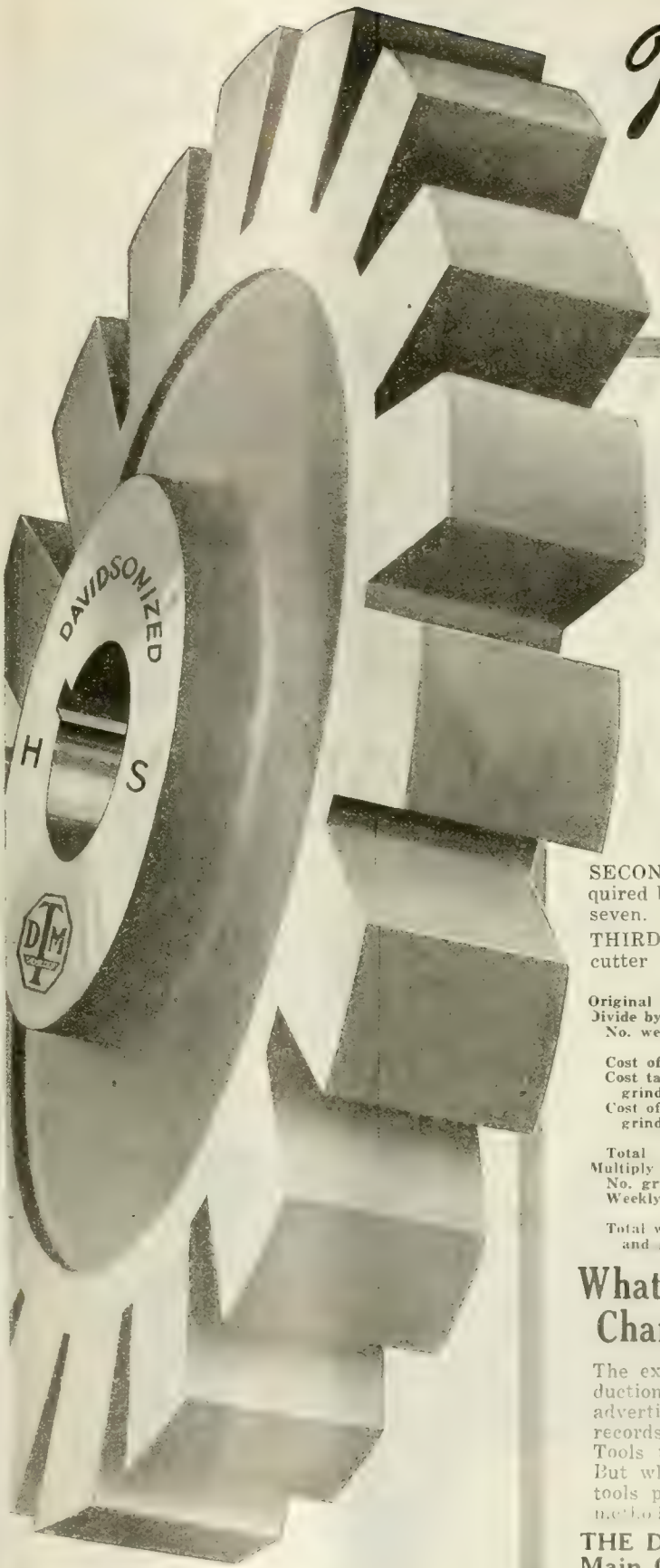
Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS DOUBLE SS

PROMPT SHIPMENTS from large stock



What's the Percentage?

HERE'S a simple little problem in tool costs, with a great big answer when applied to your own conditions.

FIRST—read this report on a Davidsonized Milling Cutter, from one of the best-known plants (name on request):

> "The man on the machine where the cutter was tested says that it is the best cutter he ever had. He says it stood up for 19 hours without stopping and then could have been put into perfect shape with a little oil stone. The best they get out of their own cutters is between 10 and 11 hours.
> "The material was cast steel, full of sand holes and chilled spots; the feed, 5/8-110-40."

SECOND—Consider that for every four grindings required by the Davidsonized Tool, their own tool required seven.

THIRD—Apply the same comparison to some milling cutter you are now using.

Your own tool.	Davidsonized tool
Original Cost of Tool .. $..	(Assume to be same as opposite) $
Divide by	
No. weeks of life .	(75% more than opposite)
Cost of Tool per week..$. .	$
Cost take-down time per grinding	
Cost of grinding time per grinding	(Same as opposite).....$..
Total cost per gr. $	(Same as opposite) $
Multiply by—	(Same as opposite).....$..
No. grindings per wk...$.	
Weekly cost of grinding . .	(1-7 of opposite) $
Total weekly cost of tool and grinding $	$

What's the Percentage of Saving by Changing to Davidsonized Tools?

The example cited takes no account of the faster production made possible by Davidsonized Tools. In later advertisements we will cite more instances of actual records proving the extraordinary ability of Davidsonized Tools to cut production costs as well as tool costs. But why wait? Consult us now, and find what these tools produced by the new and revolutionary Davidson method can do for you.

THE DAVIDSON TOOL MFG. CORPORATION
Main Office : 118-122 Maiden Lane, New York
Works: 56-62 North 6th Street, Brooklyn, N. Y.

SPECIAL SERVICE

To Concerns Who Make Their Own Tools.

We will supply Davidsonized High Speed Steel Blanks in the semi-finished state, hardened and finished within grinding size (about .01 to .015 stock to be removed from working surfaces). This service enables the user to obtain these tools of unequaled quality at a cost which compares favorably with that of tools made from the solid bar.

THERE IS "A REASON WHY"

When Germany signed the Armistice, Walcott Lathe Company accepted cancellations of orders for Lathes amounting to hundreds of thousands of dollars. Not one cent of damage from the United States Government or anyone else was claimed on account of the cancellation.

YOU SAY, WHY

Because Walcott Lathes are standard equipment throughout. They are built and designed for manufacturing purposes in sizes to meet every requirement of your shop. Thus, we have had a constant increasing demand for Walcott Lathes for the past thirty-eight years, not from one section of the country, but from all over the world. Our business is good, and our plant is running full time, not a man idle.

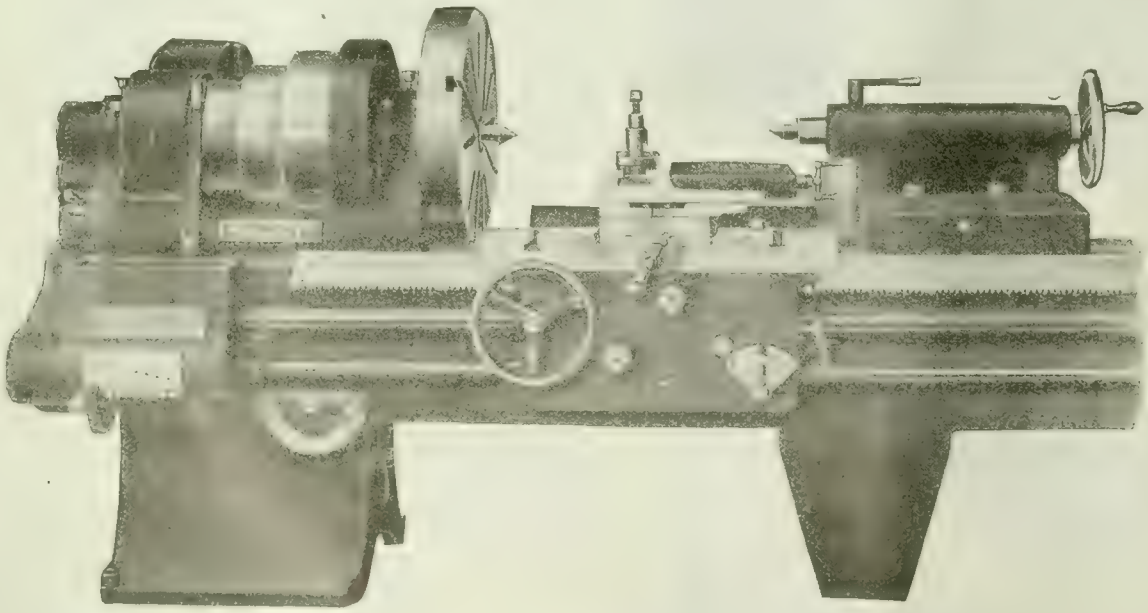
If you are interested in new Lathes, specify the WALCOTT, and you will find by their many advantages "The Reason Why."

WALCOTT LATHE COMPANY

Engine Lathes

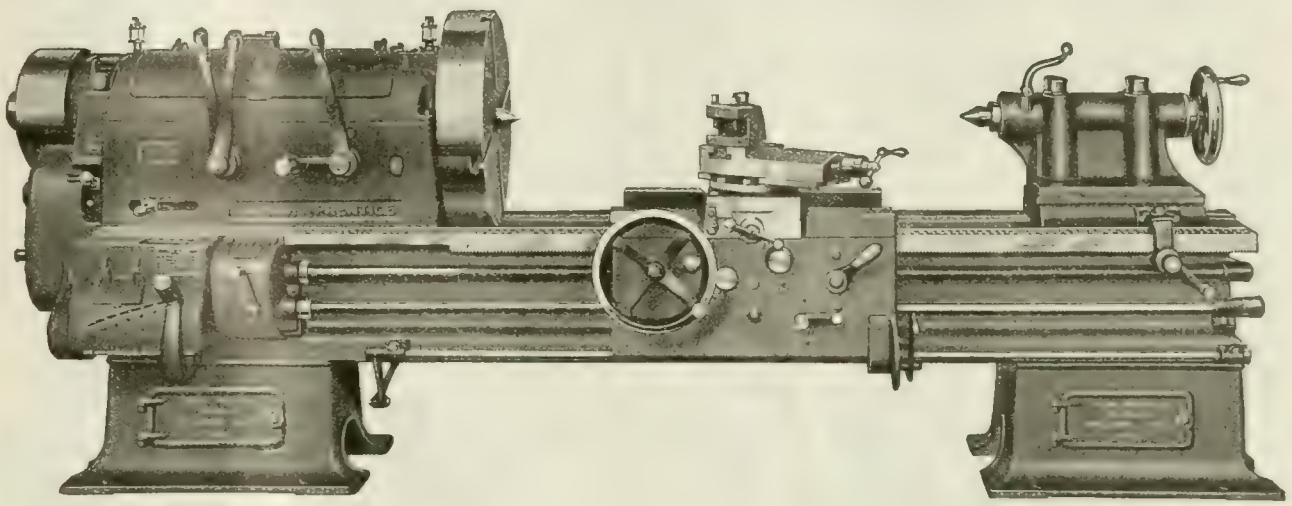
140 Calhoun Street - JACKSON, MICHIGAN

AGENTS:—Hill, Clark & Co., Chicago, Ill.. Frevert Machinery Co., New York City, N.Y. W. E. Shipley Machy. Co., Phildelphia, Pa. National Supply Co., Toledo, Ohio. Motch & Merryweather Machinery Co., Pittsburgh. H. A. Smith Machinery Co., Syracuse, N.Y. Wm. E Duff, York, Pa. Wm. E. Duff, Jacksonville, Fla. Brown-McDonald Machy. Co., St. Louis, Mo. Smith-Booth-Usher Co., Los Angeles, Calif. Hendrie-Bolthoff Mfg. Co. & Sup. Co., Denver, Col. Gordon & Finkbeiner, Portland, Ore. Northern Machinery Co., Minneapolis, Minn. Brownell Machinery Co., Providence, R.I. Chas. A. Strelinger Co., Detroit, Mich. Marshall & Huschart Machinery Co., Indianapolis, Ind. Fenwick, Freres & Co., Paris, France. Buck & Hickman, Ltd., London, England. Parke & Lacey Co., Sydney, N.S.W. Standard Machy. & Supplies, Ltd., Montreal, Que. Canadian Fairbanks-Morse Co., Ltd., Toronto, Ont.



REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.



WORTH WHILE THINKING OVER

"PRENTICE" GEARED HEAD LATHES APPEAL MOST STRONGLY TO THE THINKER. TO THE MAN WHO "JUST WANTS A LATHE" ALMOST ANY LATHE WILL SATISFY.

REED-PRENTICE MACHINE TOOLS WILL MEET YOUR MOST EXACTING STANDARDS OF ACCURACY—BUT, FURTHERMORE, GEARED HEAD "PRENTICE" LATHES WILL TURN OUT MORE WORK, WITH LESS EFFORT IN GENERAL PRODUCTION, THAN YOU CAN OTHERWISE ACCOMPLISH.

THE REASON FOR THIS IS THAT SPINDLE SPEEDS, FEEDS AND SCREW CHANGES CAN BE MADE INSTANTLY WITH SAFETY TO BOTH MACHINE AND OPERATOR.

YOUR INCREASED EARNINGS DUE TO THE RAPIDITY WITH WHICH THESE LATHES CAN BE MANIPULATED WILL BE CONSIDERABLE WHEN VIEWED OVER A YEAR'S TIME.

WE WILL BE GLAD TO GIVE YOU AMPLE PROOF OF OUR CLAIM.

CANADIAN FAIRBANKS-MORSE CO., ETD.
MANNING, MAXWELL & MOORE, INC.
FENWICK FRERES.

Notes on Grinding
NORTON COMPANY, WORCESTER, MASS.

No. 47A

Correct Work Speeds For Internal Grinding

The correct speed at which the work should rotate depends upon a good many details, such as the type of the machine used, the finish required, the condition of the work—that is, whether hard or soft—and the diameter of the hole as compared to the diameter of the wheel.

There is one point, however, of considerable importance and that is that the work should not run at the same speed for grinding a 3″ hole that it would for grinding a 1″ hole. Operators are apt to be very careless with regard to this point and seem to have an inclination to run the machine at the highest speed, irrespective of whether they are working on a small hole, say 1″ in diameter, or whether they are grinding a hole which is 2″, 3″ or 4″ in diameter.

The higher surface speed of the work having the large hole tends to break down the work face of the wheel and, consequently, the wheel then appears too soft, and to wear down too easily, whereas the difficulty is simply that the work rotates at too high a speed and if the speed of rotation is cut down so that the surface speed corresponds to that prevailing with the small hole, the action of the wheel will then correspond more nearly to the action of a wheel of similar grade on the small hole.

If instead of slowing down the work speed, a wheel of harder grade were selected, which does not cut as freely as the softer one would, then the time required for grinding will be increased and be actually longer than the time required with the softer wheel and a more moderate speed of the work.

Alundum wheels of the vitrified process are recommended for the internal grinding of hard and soft steel. For cast iron, semi-steel, brass and bronze, use Crystolon wheels.

NORTON COMPANY

Canadian Agents—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria—F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

ELECTRIC FURNACE PLANTS NIAGARA FALLS N. Y. CHIPPAWA ONT. NEW YORK STORE 151 CHAMBERS ST. CHICAGO STORE 111 NO JEFFERSON ST.

MARK YOUR PRODUCTS THE "MATTHEWS" WAY



"Matthews-made" steel stamps and lettering dies make easily read and durable marks on all classes of products. Matthews Champion Type Holders—for flat and convex surfaces—with interchangeable Steel Type, save time and lower marking costs. Matthews Inspection Hammers of best Pittsburgh Steel, are fashioned with the "know how" of over 50 years' experience.

Booklet "For Light and Heavy Marking" sent on request. Write for a copy of it.

Canadian Fairbanks-Morse Co., Limited

Montreal, Toronto, St. John, Quebec, Ottawa, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

Jas. H. Matthews & Co. - Pittsburgh, Pa.

Steel Lettering Dies and Stamps

IMPERIAL CARBIDE



For Welding Cutting and Lighting

HIGHEST GAS YIELD IMPERIAL CARBIDE MADE IN CANADA

Manufactured by

Union Carbide Co. of Canada, Ltd.

Head Office: Dominion Bank Bldg. TORONTO, ONT.

Works: WELLAND ONT.

Large Stocks maintained at convenient distributing centres throughout Canada



Grinding a Pull Back Ram for a 3000 Ton Hydraulic Press

Grinding down a 13-foot 9½-inch machine steel ram from the rough lathe cut to a finished diameter of 5½ inches, with a tolerance of .002 inch, requires a steady, vibrationless machine—precisely what the Watson-Stillman Co., Alden, N.J., have in the 20 x 168-inch Norton Grinding Machine shown above. That concern uses this "Norton" for all general cylindrical grinding purposes; in fact, on a variety of work ranging from ½ x 4 to 8 inches x 14 feet; also short pieces of larger diameter, swings 32 inches diameter in the gap—and the results are remarkably satisfactory. The work is accurate and finished so quickly as to bring manufacturing costs down to bed rock.

The service of our engineering department are at your command. We have an immense quantity of data on almost every conceivable kind of work. Now, perhaps we can show you a way to reduce your present costs. Send us your blueprints for suggestions.

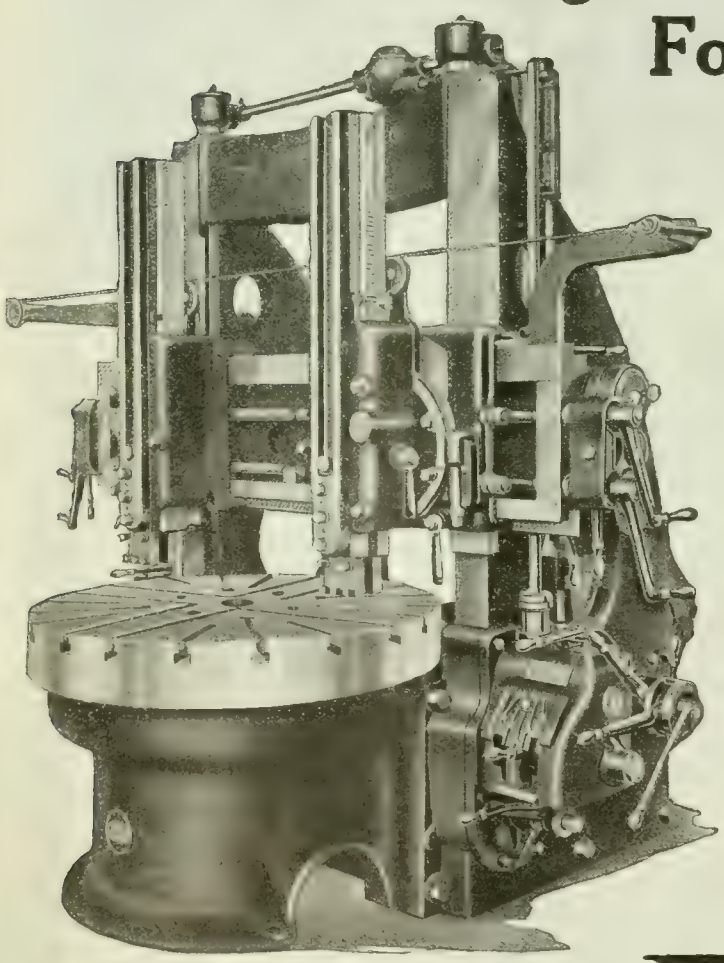
Norton Grinding Company, Worcester, Mass.

Chicago Store: 11 North Jefferson Street

Vonnegut Machinery Company, Indianapolis, Ind. **Robinson, Cary & Sands Company,** St. Paul and Duluth, Minn. **Manning, Maxwell & Moore, Inc.,** St. Louis, Mo. **Henry Prentiss Co.,** New York, N.Y., Boston, Mass., Buffalo, N.Y. Rochester, N.Y.; Syracuse, N.Y.; Scranton, Penn. **The Motch & Merryweather Machinery Company,** Cleveland, O.; Detroit, Mich.; Pittsburgh, Penn., Cincinnati, O. **Eccles & Smith Company,** San Francisco, Calif.; Los Angeles, Calif. Portland, Ore. **The Canadian Fairbanks Morse Company, Ltd.,** Montreal, Que., Toronto, Ont.; Vancouver, B. C. **C. T. Patterson Company, Ltd.,** New Orleans, La. **Kemp Machinery Company,** Baltimore, Md. **W. E. Shipley Machinery Company,** Philadelphia, Penn. **English Tool & Supply Company,** Kansas City, Mo. **Alfred Herbert, Ltd.,** Coventry, Eng., Paris, France; Alger, Paris. **The F. W. Horne Company,** Tokio, Japan. **Izznosskoff & Co.,** Petrograd, Moscow and Ekaterinburg.

GIS

Gisholt Boring Mills Are Needed For the Days Ahead



Days of activity on pre-war manufacturing; days which manufacturers should prepare to face with renewed zeal after the recent period of interruption.

Gisholt Boring Mills are ready to play their part in offering to manufacturers the machine they need for securing maximum results.

In all respects a Gisholt Boring Mill is a typical Gisholt Tool, designed with the Gisholt aim of securing performance and results through the medium of the machine.

With Gisholt Boring Mills in your shop you can approach the coming days with ***confidence*** *and* ***enthusiasm.***

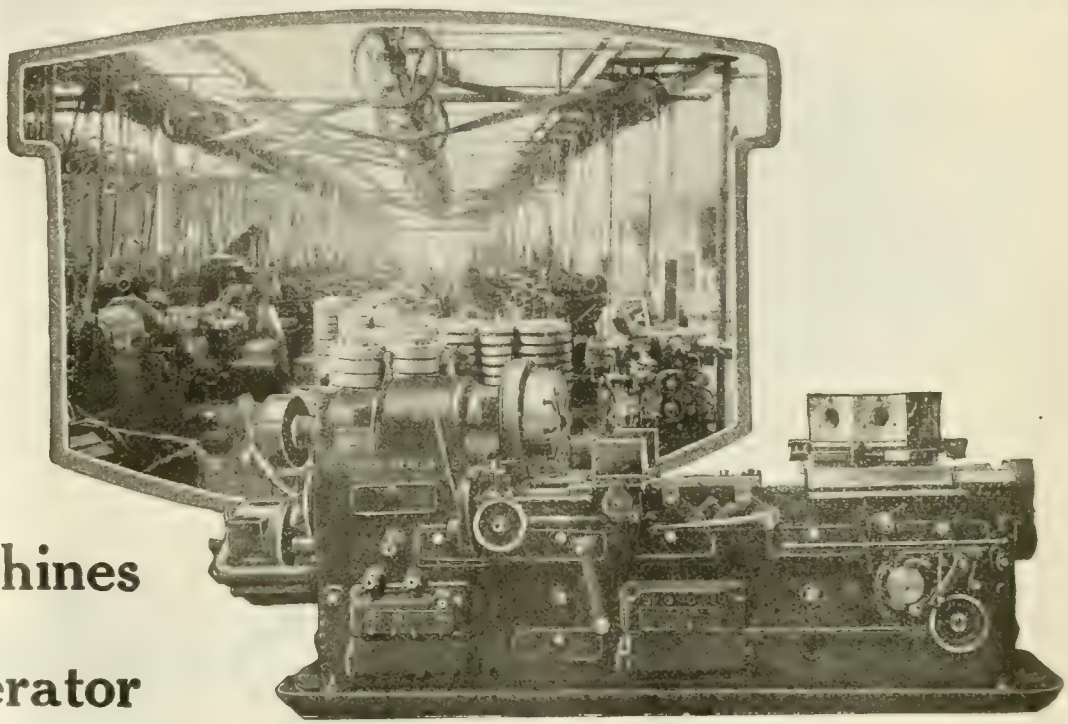
GISHOLT MACHINE COMPANY, 1153 EAST

Builders of Standard and Automatic Boring Mills, Tool Grinders

Eastern Sales Office: 30 Church St., New York

CANADIAN AGENTS: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

HOLT



Two Machines and One Operator

80 to 85 Flywheels Per Day

A healthy tinge of pre-war activity; the sort of normal manufacturing which will keep your plant busy.

Former production, (before the installation of the Gisholt Automatic Turret Lathes) two machines and two operators, 70 to 75 wheels per day.

Let Gisholt production help you resume your normal operations with a greater capacity to forge ahead than when you last handled pre-war work.

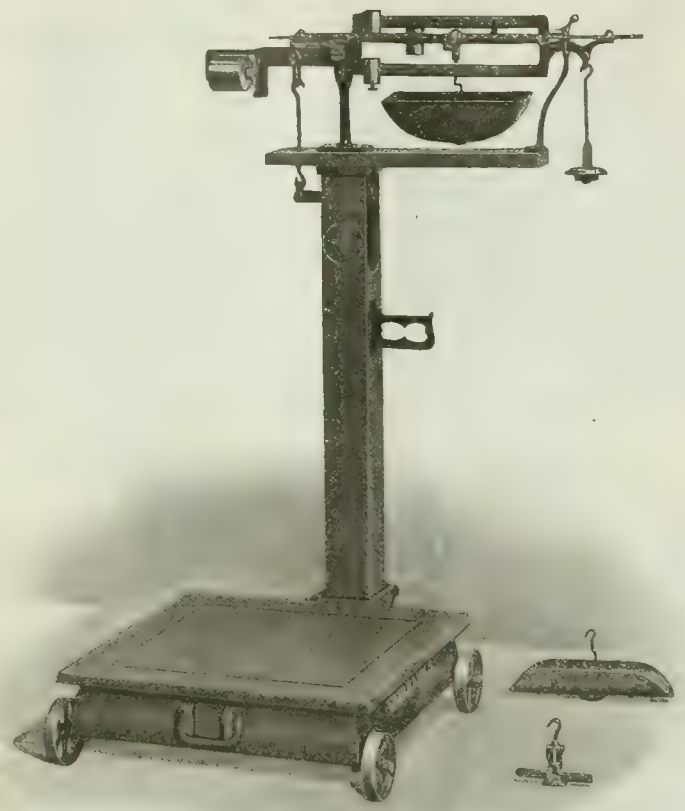
The tide is turning fast. Gisholt Automatics will help you keep your place in the stream.

WASHINGTON AVE., MADISON, WIS., U.S.A.

Turret Lathes, Vertical and Horizontal
Small Tools, Special Machinery, etc.

Works: Madison, Wis.; Warren, Pa.

CANADIAN AGENTS: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Vindsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria





Fairbanks Counting Scales

—not only weigh, but by means of our special counting device, compute the number of parts or pieces in the package.

The method of computing is one of ratio weight, scientifically applied. It removes any chance of confusion of figures, errors in estimates or defective calculations—and is simple and easily operated.

The counting equipment in no way diminishes the value of the scales for weighing purposes. These scales are indispensable in foundries making small castings, machine shops, hardware plants, etc. Made in various sizes from 25-lb. capacity up to 2,500 lbs.

Write to-day for full information about Fairbanks Counting Scales and other weighing equipment made by

Canada's Largest Scale Makers.

The Canadian Fairbanks-Morse Co., Ltd.

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg
Saskatoon Calgary Vancouver Victoria

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXI. No. 23. June 5, 1919

Making Steel in Canada

GREAT Ore Deposits in the Eastern Section of Canada — The Various Things That Enter into the Making of Our Steel—The First of a Series of Articles.



THE purpose of these articles is to describe accurately and in simple, non-technical language, the various steps and processes by which the finished steel product is produced. By finished steel product we mean the product of the steel mills, such as billets, bars, rails, structural beams and angles, steel plate, rods, wire, etc.

During the past four years many persons, both male and female, who previously had had nothing whatever to do with the iron and steel industry came in contact chiefly with the materials used in munition work, and many of them were led to ask questions concerning the materials they handled.

Their questions would be founded on the various terms they heard used from day to day. They would ask the difference between iron and steel, the meaning of "high carbon," "low carbon," and why steel, high in sulphur, should be looked upon as such a dangerous quantity.

They would ask what is a blooming mill, how do mills work, from whence came the forgings, the round bars, and why they had to be rolled, why they could not be made direct from the blast furnace, and what was the difference between open hearth steel and Bessemer steel, and what was the meaning of the duplex process, etc., etc.

It is with the intention of bringing information to such inquiring minds, and of shedding more light to those who are better acquainted with one process, but not with the whole, that these articles are written.

Of the importance of steel little need be said. Steel and civilization go hand in hand. Take steel from our modern life and we return at once to the ages of barbarism. Transportation systems would break down, education, without printing, would be very nigh impossible, and printing without steel could not be effected.

At a meeting of an agricultural society, held not long ago, one of the leading men made the statement that civilization was dependent upon agriculture, but he forgot to state that without the steel industry modern methods could not be employed with regard to that most important industry. Right here let us give credit to the coal industry upon which even the steel business to-day is dependent.

Practices in Canadian Plants

We are not concerned just now with the historical side of the iron and steel industry—deeply interesting though that study is—we are going to deal with modern methods and in particular with the methods as practised in Canadian plants. The war has put the iron and steel industry in Canada on a basis that could not have been obtained in ten years of peace. Companies that doubted their own ability, that doubted the energy and enterprise of their men, have been forced because of war conditions to venture their all, and to take steps, sometimes chances, that otherwise they would not have dared to take,—and let it be here recorded that in the majority of instances the results have absolutely justified the means.

Our subject is a large one. We will try to handle it in a manner as to be interesting as well as instructive. As far as possible we will describe the various processes in their correct order or sequence.

We must first have raw materials. The most important are—iron ore, coke, and limestone.

Iron Ore the Basic Material

Iron ore is the basis of all iron and steel products. Iron itself is one of the most common elements in nature. It has been stated that between four and five per cent. of

the earth's crust is composed of this element in one form or another.

Iron is seldom, or never, found in its pure condition. It is usually found as an oxide of iron. By an oxide we mean that an affinity has taken place between the native iron and oxygen, resulting in an oxide of iron, or to put it crudely—iron rust. The iron ore will contain anywhere from twenty-five to seventy-five per cent. of iron.

Iron ores may be divided roughly into four principal different kinds: Magnetite, Hematite, Limonite, and Siderite.

Magnetite ore is so named because of its magnetic properties. It is one of the purest ores known. There are some magnetite deposits worked in the United States, but the largest deposits at present in operation are situated in Norway and Sweden.

Hematite ore is generally of a reddish color. Good hematite ore will run between sixty and seventy per cent. iron. It is particularly suited to blast furnace operation, as it contains very little moisture, and what moisture it contains can be readily driven off at a low temperature. A large percentage of the ore mined and used in the United States is of this variety, and practically all of the ore used by the large steel companies in the Eastern Provinces of Canada is hematite ore.

Limonite ore is of a brownish to reddish-black color. It runs between fifty-five to sixty per cent. iron.

Siderite ore is of a light gray color. It contains between forty and fifty-five per cent. iron, and has a high moisture content. Siderite ore usually requires a previous treatment, such as roasting, before reducing in the blast furnace. A large deposit of siderite ore is at present being worked by the Algoma Steel Company, near Michipicoten, Ontario.

Not Much Iron Ore Mined

Iron ore has been found and mined in New Brunswick, Nova Scotia, Quebec, Ontario and British Columbia. The output of iron ore in New Brunswick never amounted to very much. Nova Scotia has produced as large as 100,000 tons in one year, but of late has dwindled down to almost nothing. Quebec never produced more than 22,000 tons per year, and in 1916 produced only about 3,000 tons. Ontario, starting with a very small amount, has increased its shipments to 400,000 tons per year. British Columbia has not produced any ore since 1907. The total amount of ore produced in Canada in 1916 was about 600,000 tons, and yet compare this small tonnage of ore produced with the fact that in 1913 (before war conditions) Canada imported from other countries iron and steel products to the value of $145,226,972.00. At an average value of fifty dollars per ton this would mean nearly 3,000,000 tons of steel, or five times the tonnage of ore the country produces.

Although Canada herself produces so little iron ore at the present time, her sister colony, Newfoundland, is much more favorably situated.

Newfoundland is a rocky, rugged island, to the east of Canada. It has been called "the Norway of Canada." The coast is formed of high cliffs, rocky promontories, and deep gorges. The whole aspect of the country suggests the upheaval of nature, which usually results in mineral deposits of great value. The people of this island for very many years did not realize the value of deposits. They are an honest, simple folk, and earn their living by fishing, and some farming in the interior. A story that has often been told, and will bear repeating, will illustrate the knowledge of the general people upon mineralogy, etc.

An Englishman, touring probably, visited Newfoundland. One morning he took a stroll along the coast, and stopped to discuss the weather, etc., with one of the natives, who happened along. The following conversation ensued:

Englishman.—"Pretty rocky coast you have around here. Has it always been like this?"

Fisherman.—"Yessir, yessir, — allays been like dis since I recommember."

Englishman.—"Hm! Probably so. But there's been an earthquake or some great upheaval of nature sometime or other?"

Fisherman.—"Nossir, nossir, — not whilst we been here."

Englishman.—Getting rather wrathy at the contradiction, and wishing to get some information on the subject, —"But, my dear man, you're wrong! Do you mean to tell me that there has never been an earthquake here? I am sure there has!"

Fisherman.—By this time doubting his own knowledge, scratched his head, and replied,—"Well sir, now I come to think on't, sir, I do believe you're right, sir. I did hear tell that Cap'n Skipp'r Jones caught one in his nets the other night. Yes, sir, he did!"

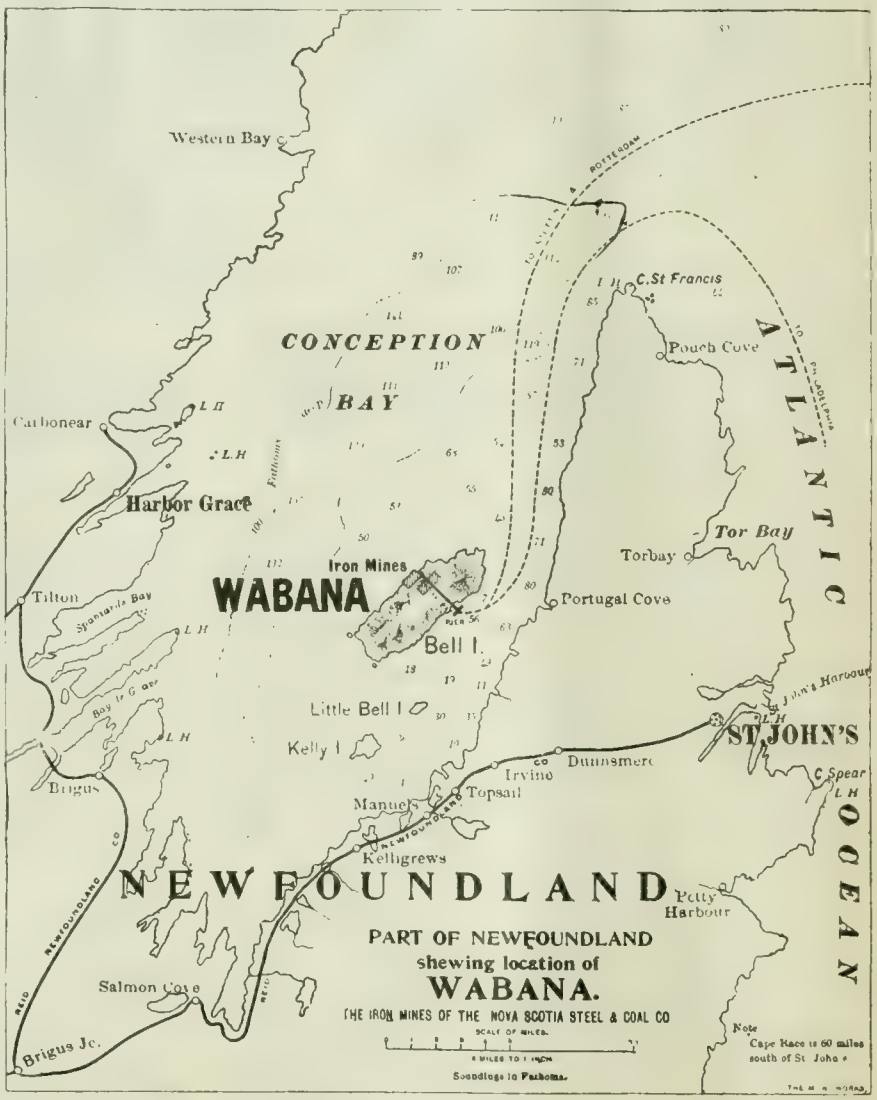


FIG. 2- LOCATION OF ISLAND AND WORKINGS.

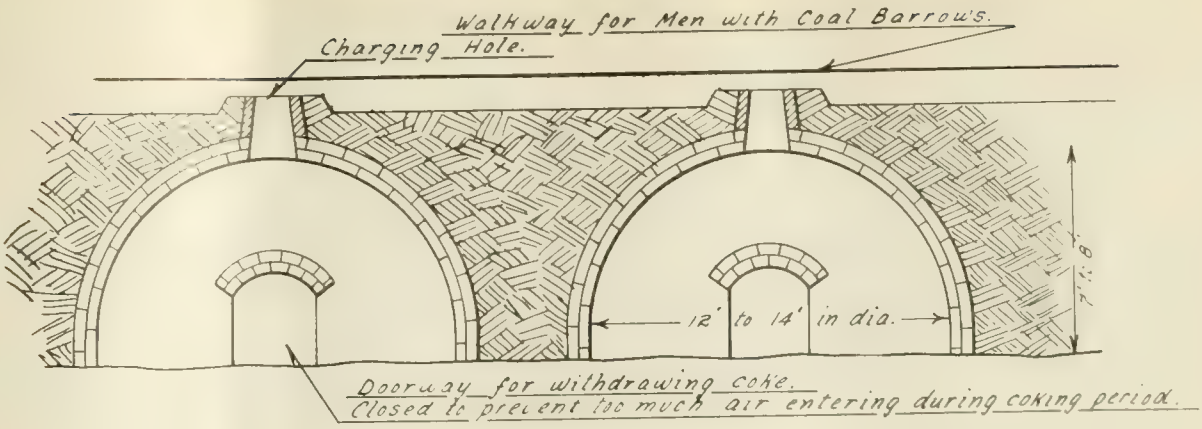


FIG. 4—BEE HIVE COKE OVENS.

Where the Big Output is Located

On the eastern shore of this island there is a deep inlet, known as Concepcion Bay. Up the bay there is an island, known as Belle Isle, so called from a peculiarly shaped rock situated at one end. But for this island, one of the most valuable and important deposits of iron in the world would have remained unknown, for its northern shore forms a suitable place for the outcropping of the ore beds to expose themselves. The mine has been named "Wabana." This is an Indian word, the literal translation of which is "the easternmost place on the continent," the real word being "Waban," meaning "light," and "Woban," meaning "daylight."

See Fig. 1 and 2 for the location of island and the workings.

The outcrop of hematite ore on the shores of the island does not seem to have attracted very much attention until 1893, when the mining rights were purchased by the Nova Scotia Steel & Coal Company, Ltd., from Messrs. Butler, of Topsail, Newfoundland. This company, whose history is closely interwoven with the history of the steel industry of Canada, commenced at once to develop their holdings on the island, and on Christmas Day, 1895, the first shipment of ore was made to the company's blast furnace, then stationed at Ferrona Junction, Pictou County, Nova Scotia. Since this day the Wabana Mines have been in continuous operation and approximately 17,000,000 tons of ore have been extracted. Some idea of the tremendous amount of ore available in this deposit may be realized when we remember that Mr. James P. Howley, F.G.S., the director of the Newfoundland Geographical Service, stated that the Wabana basin contained in his opinion, 3,635,000,000 tons of ore. This deposit, the pioneer work connected with which was undertaken by the "Scotia" Company, was afterwards sub-divided to enable the Dominion Iron & Steel Company, which was formed in 1899, to have a share.

In the early years the ore was mined by simply attacking the outcroppings, as in an ordinary stone quarry. As time went on and the amount of "cover" over the deposit became greater, due to the dip of the seams, stripping was resorted to. Later on still tunnels and shafts were sunk, extending to two or three miles under the waters of the bay. The ore is mined by what is known as the room and pillar system. That is to say, at various distances along the main tunnel, headings are driven off at right angles. Off these headings rooms are opened parallel to the main tunnel. The rooms are located about 35 feet apart and are 15 feet wide, and are thus separated by a solid pillar, 20 feet in thickness. Every 40 feet this pillar is broken through, connecting the rooms together. The ore is loaded into cars and by means of a haulage system conveyed to the surface. At the surface the necessary plant is situated for crushing and loading into other cars, by means of which it is transported to the other side of the island, where the storage docks and shipping piers are situated. Few people have any idea of the loading facilities which have been developed by the companies concerned at Wabana. Ore has been loaded at the rate of 2,200 tons per hour through a single chute, and on occasions when two chutes could be used simultaneously, 12,500 tons have been loaded in 3½ hours.

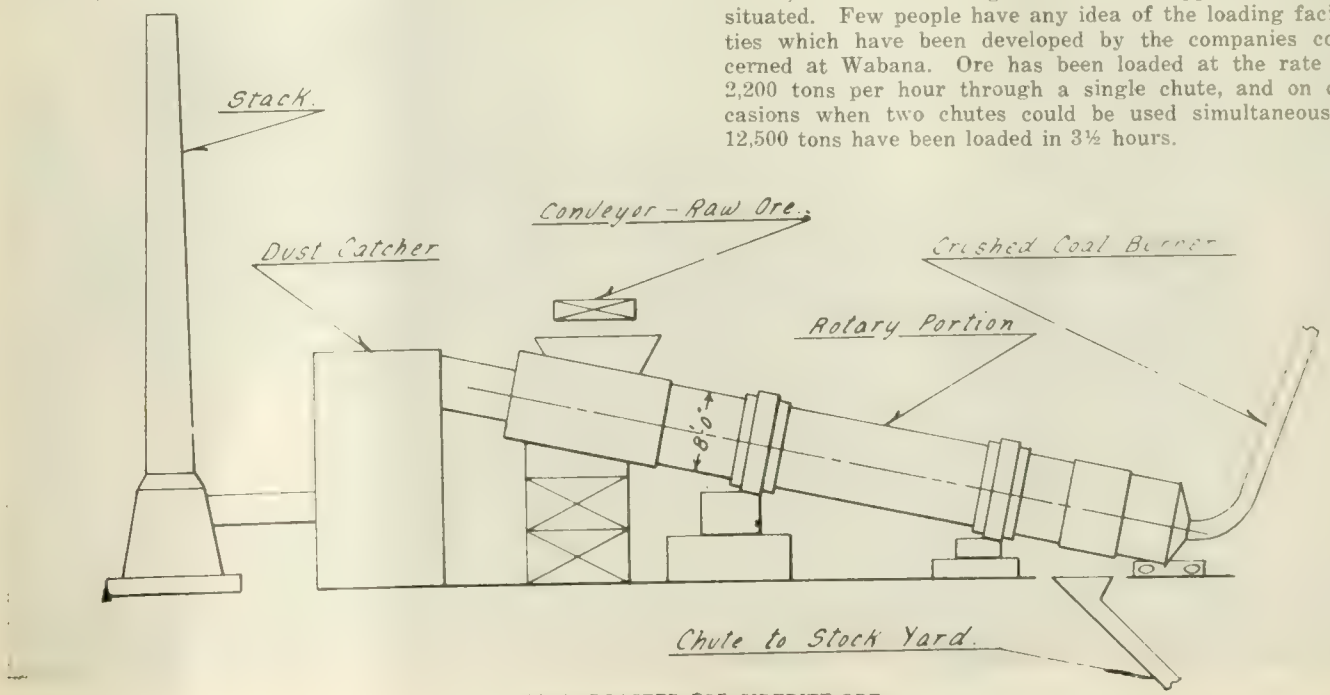


FIG. 3—ROASTER FOR SIDERITE ORE.

Shipping The Iron Ore

In the case of the Dominion Iron and Steel Company, the ore is conveyed by steamers direct to Sydney, Nova Scotia, 412 miles from the island. Here it is unloaded by modern unloading machines and conveyed by means of cars to the stock pile.

In the case of the Nova Scotia Steel and Coal Company, the ore boats are unloaded at North Sydney, and the ore taken by means of cars to the blast furnaces at Sydney Mines.

Coming back to Canada,—it must be remembered that the vast deposits just previously described belong entirely to Newfoundland—we find that the only deposits at present being worked to any large extent are the "Helen" and "Magpie" Mines near Michipicoten, Ontario. The ore from the "Helen" mine is of the magnetite variety, but high in sulphur. The ore from the "Magpie" mine is of the siderite variety. It contains about thirty-four per cent. metallic iron content.

In order to reduce the bulk of the material to be handled in the blast furnace, and to drive off some of the other objectionable ingredients, this ore is roasted.

The roasting process consists in passing the ore through an inclined rotary kiln, about eight feet diameter, and one hundred and twenty-five feet long. The kilns are fired with pulverized coal. The roasted ore passes out from the kiln to a stockyard where it is handled by overhead cranes, into cars and sent to the blast furnace. The diagram Fig. 3 will assist to make clear this process.

Other Canadian Ore Deposits

There are many other ore deposits in Canada, but, owing to the nature of the ore and their situation they are not at present widely worked. If the reader desires a more detailed description of the iron ore occurrences in Canada, he should send to the Department of Mines, Ottawa, for some of the publications that are available on the subject.

The difficulty with regard to smelting low grade high sulphurous ores is one of the problems that confronts the steel works engineer of the future. Some one of the rising generation is going to attack the problem and find the solution—it should be a Canadian, trained in one of our own schools.

We have also to learn how to use our low grade coals and to consider the possibilities of peat as a fuel, and a producer of important by-products.

Up to this time we have simply been taking ore as a single substance. Let us now look at it a little closer and see what it is composed of. There is, first of all, the iron, and the oxygen, which has taken such a strong affinity to it. This we have called oxide of iron. The oxygen has got to be divorced from it so that the pure metallic iron can become available. There is also a number of other earthy substances, such as silica, alumina, phosphoric acid, lime, manganese, sulphur. All these substances are known by the name of "gangue." They have to be gotten rid of before the iron can be used for industrial purposes. When the nature of the ore demands it, some are expelled by roasting, but in the majority of cases the work is done in the blast furnace.

Let us examine some of these impurities a little closer, and see what they really are:

Silica is a portion of the earth's crust, a species of sand. If allowed to continue in the metal it causes planes of weakness, and the product would be unreliable.

Sulphur is one of the worst impurities that the steel maker has to contend with. It causes what is known as "red-shortness," that is to say, the material is brittle when at red heat. High sulphur billets, instead of being ductile, and rolling with ease into various shaped bars, frequently break and crumble. Sulphur is usually limited to .05 per cent. in good grades of steel.

Phosphorus produces what is known as "cold-shortness." This is the very opposite to "red-shortness," and

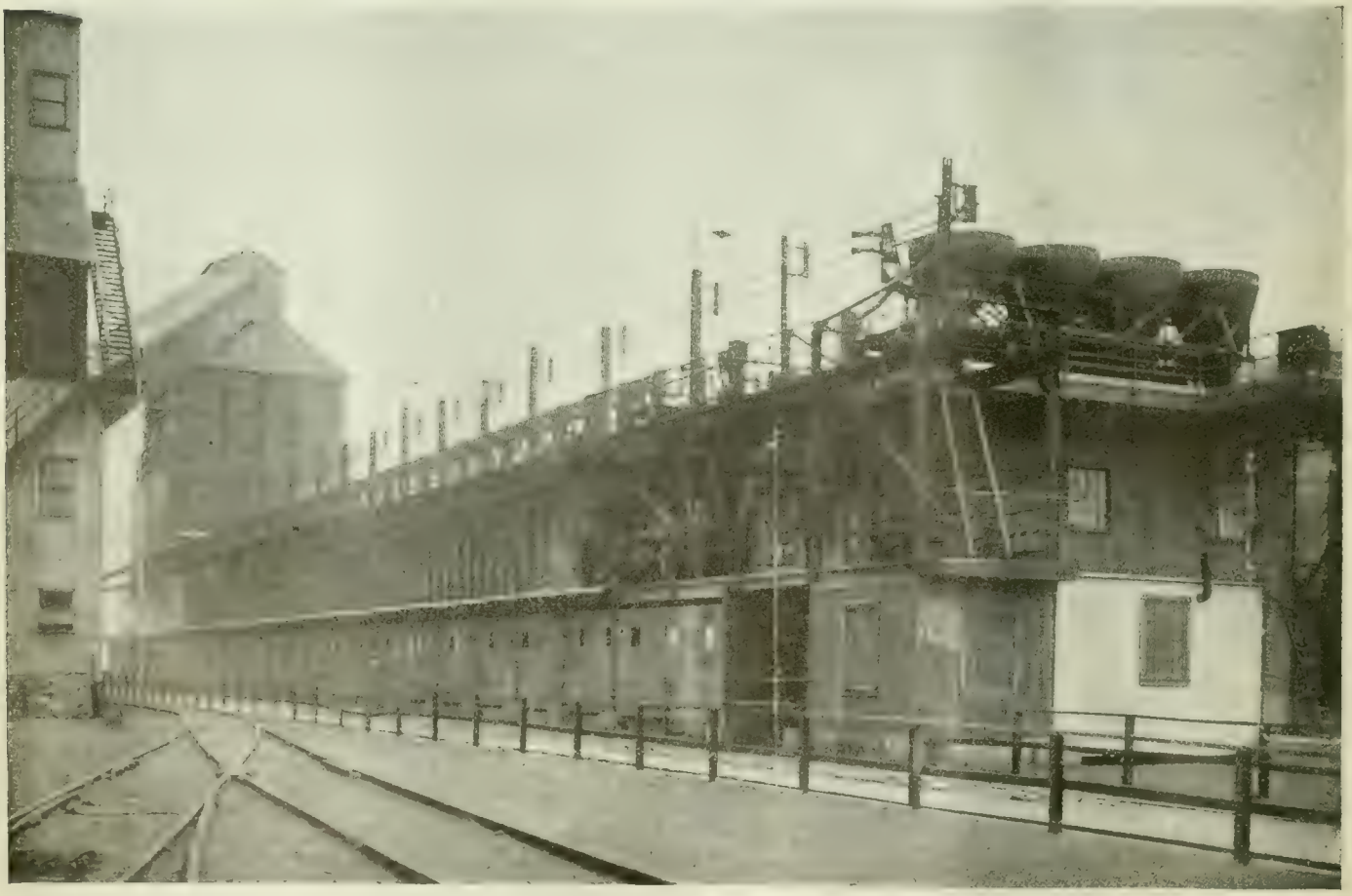


FIG. 6.

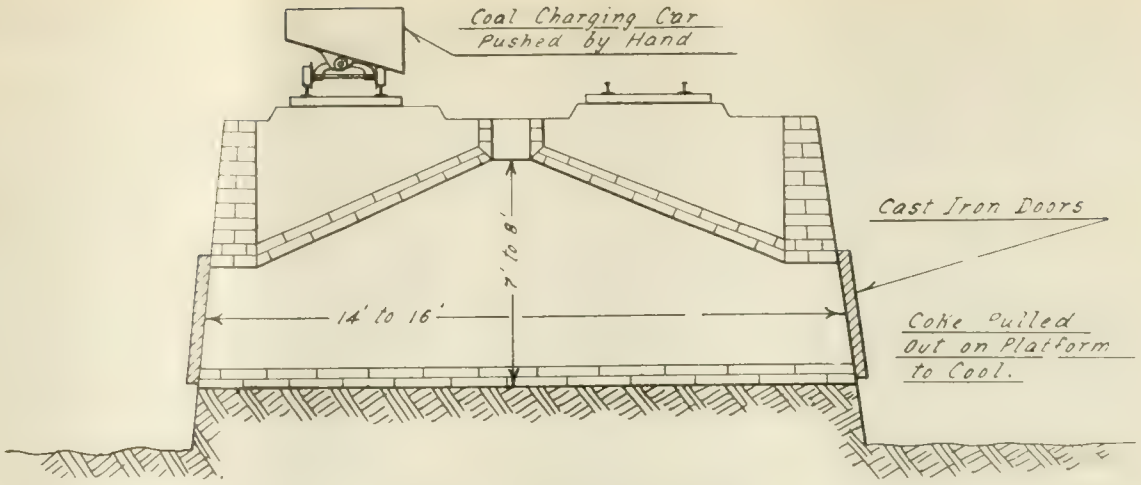


FIG. 5—BELGIAN COKE OVEN.

means that while the material can be worked when hot, yet is to a certain extent very brittle when cold.

Manganese is desirable as it strengthens and adds a certain wearing quality to the steel up to a certain point. Above that point, however, it produces a brittleness. In ordinary steel it is kept down to .03 per cent. or .05 per cent.

We have not touched in the above on the subject of carbon. The amount of carbon in the blast furnace product varies from 2½ to 3½ per cent., and in determining the ultimate use and strength of the finished product a few points difference in the carbon content makes a vast difference.

As we are only dealing with ore, the subject of carbon, sulphur, phosphorus, manganese, etc., will be left now until we again consider them in their proper places.

Having now mined our ore, crushed it, delivered it to the steamer, unloaded and transported it to the stock pile at the blast furnace, we will consider briefly coke and lime before describing the blast furnace.

Coke

Charcoal and coal were both used for blast furnace fuel in the early days, but for modern furnaces of large capacity whole districts would have to be laid waste to provide charcoal for a single year's service.

For a few small furnaces, working on special iron, charcoal is still preferred, on account of its freedom from impurities.

Coal packs too tightly in the furnace stack and prevents the blast and gases from passing upward. Some furnaces are working on a mixture of coke and anthracite coal.

The ideal fuel for a furnace must be free from foreign matter, fairly open in structure, to allow of gas passage, and strong to stand the weight of sixty to eighty feet of ore and fuel. Good coke is the answer, but never yet have I heard a furnace superintendent speak of the coke he received as good.

All Coal Will Not Coke

To make coke you must have coal, and coal of the right kind. All coal will not coke—just why no one seems to know exactly.

Coking consists of heating the coal and thus driving off the volatile or gas portion, the residue consisting chiefly of carbon, ash, a little sulphur, and is termed coke.

As a general rule, 2 000 pounds of coal will make 1,400 pounds of coke, that is to say, 30 per cent. volatile is driven off.

Now let us consider what happens to coal when it is heated in any kind of coke oven.

First, like most other substances, heat causes expansion, then the coal softens, and it becomes a tarry mass, gas forms and passes upward, causing passages in this substance, and as the gas passes away it hardens, leaving a hard open grained material.

Coke is made in ovens. The crudest type is the Beehive. (See Fig. 4). One oven helps to heat the other as they are charged alternately.

These ovens were in many cases charged by hand and coke pulled out by hand and quenched by hand, then forked into cars by hand, and if you wish to know what hard work is—try forking coke for eight hours.

The next step was the Belgian oven. (See Fig. 5). Charged by an overhead car or lorry in most cases but still pulled by hand, but from both sides. Due to shape more heat was obtained from adjoining ovens, and less time and heat was lost in charging and taking out the finished coke.



FIG. 6—ANOTHER VIEW OF THE PLANT.

The next form of oven was built by many firms, it was a step in the right direction, but not quite far enough. The oven was charged by machinery—a pusher was introduced, and some of the gas was used to heat the ovens, but still the valuable surplus gas was allowed to be burned or wasted without giving up its by-products.

The Modern Coking Plant

A modern coke plant is a beautiful sight for an engineer to look upon. He sees the coal coming by rail or water, passing over silent running conveyor to the storage bin, taken from the bin with the regularity of clockwork and fed to the ovens without the touch of men's hands. He sees a machine take off a heavy oven door with the same care as a mother handles her child, the pusher with its ram, fifty to sixty feet long, pushes out seven to eight tons of red hot coke into a waiting car, the car under its own power starts off for a gigantic shower bath, and then spills the coke onto an inspection bed before the eye of the man who has planned to make these machines obey his will.

From the bed it slides onto belts and over screens to the cars.

The whole picture is one of power and regularity of movement, and one who has seen the wasted energy of olden methods, only ten years ago, cannot fail to marvel at the progress. (See Figs. 6, 7 and 8).

The early ovens produced four tons of coke in ninety-six hours, a modern oven will produce eight tons in sixteen hours.

Nothing has been said of by-products. In the modern plant every cubic foot of gas is passed through coolers, absorbers, etc., to extract the sulphates, benzols, tars, etc.

In many cases the products pay for the coal and the coke is obtained free.

But with all this we have no business. Our subject is steel, and our only use for coke is to melt the ore. We have described the process roughly so that the reader may know from whence the coke comes.

The most modern plant in Canada is located at Sydney, N.S., but both the Steel Company of Canada at Hamilton, and the Algoma Steel Corporation at the Soo, have good plants.

We now have our ore and coke, what more is required? Limestone. We said there were earthy matters with the ore, they must be caused to become liquid and float on top of the iron at the bottom of the furnace (the hearth it is called), so that it may be drained away.

A certain amount of crushed limestone renders this possible, and the foreign matter or gangue combine with the limestone and form a fluid slag.

There is, of course, a chemical reason for this, but we are concerned only with materials now.

Limestone is obtained from quarries in the usual manner—drilling and blasting, crushed, and conveyed to cars.

Now, we have all our materials, the proportions vary with the nature of each, say, 20,000 pounds of ore; 10,000 pounds of coke; 5,000 pounds of limestone.

We will next consider in more detail the largest piece of mechanical apparatus known—a modern blast furnace.

Credit must be given for some of the information with regard to Wabana to a book published by the N. S. S. & Coal Co.

To be continued.

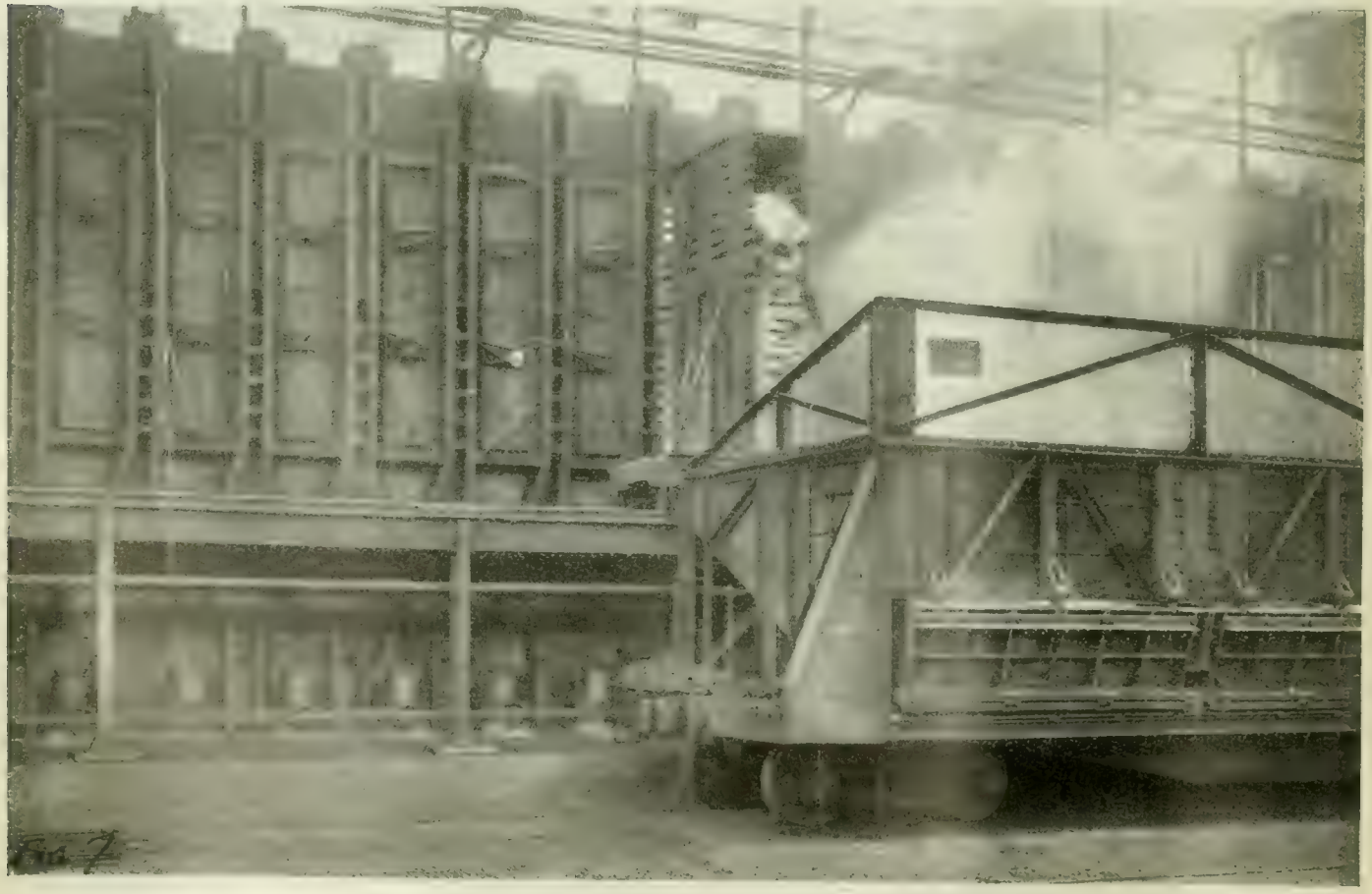


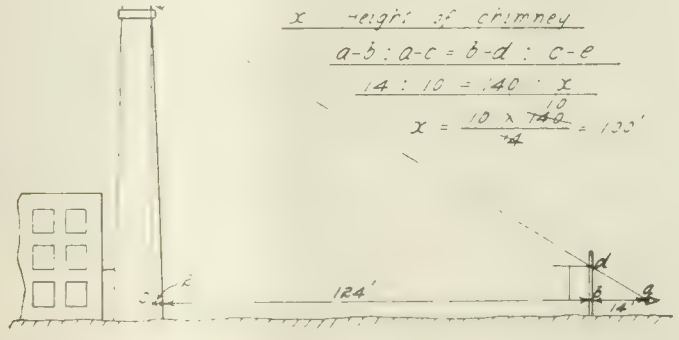
FIG. 7.—DISCHARGING COKE INTO THE CAR PRIOR TO COOLING.

Shop Arithmetic Proportion and Ratio

Sixth of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinists' Trade—The Present Article Goes Still Further Into the Subject as Above Mentioned

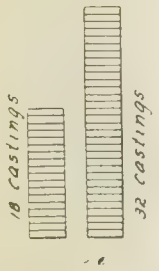
By J. H. RODGERS

BEFORE proceeding further with the subject of ratio and proportion it might be well to give a few practical examples that will demonstrate the value of this important section of mathematics. Suppose it is desired to find the approximate height of a chimney for the purpose of determining the draft conditions under which a furnace is operating. By the rule set forth in the previous lesson it was shown that the relative length of lines can be readily found by the principles involved in the solution of right triangles. To more clearly indicate the method of procedure the sketch below is given. At a measured distance (say 120 feet) from the base of the stack, place a staff vertically in the ground, and at any suitable distance from this rod a man may get a sight line to the top of the chimney, and with the various guide points, will be able to calculate the height of the stack. As seen in the sketch the right triangle is formed by the horizontal line at the height of the eye, the vertical line of the stack and the oblique sight line. The known ratio is the distance of the man from the staff to the height of that portion included between the sight lines; that is, 8:6. Then with the distance from the staff to the stack known, the unknown term, the height of the chimney, may be found by the proportion:



Adding the height below the horizontal sight line the total height of the chimney would be 96+5=101 feet.

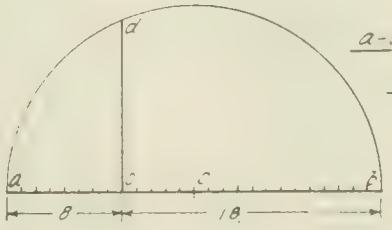
If 100 lbs. of metal is used to make 18 castings, what quantity would be required to make 32 castings of the same design? Representing the unknown quantity by X the proportion becomes:



18 : 32 = 100 : X

X = 32 x 100 / 18 = 1600 / 9 = 177.8

A mean proportion may be graphically determined by a simple geometrical figure. Using the above proportion as an example, and taking a unit of ¼ inch



With c as a centre and a radius c-a, describe the semicircle as shown.

From the juncture of the two initial as the base value of the numbers given,

8 : X = X : 18 or X x X = 8 x 18 or

$X^2 = 8 \times 18 = 144$ and

$X = \sqrt{144} = 12$

Proof 8 : X = X : 18 8 : 12 = 12 : 18

8 x 18 = 12 x 12 = 144.

A proportion that is sometimes required in solving shop problems is that of mean proportion; that is, where one value is to the second as the second is to the third. In other words, the two mean terms are of the same value, as: a:b=b:c or 2:4=4:8. When it is desired to find a mean proportion between two numbers it is found by extracting the square root of the sum of the two known values. For instance, the mean proportion between the two numbers 8 and 18 could be calculated thus: X equalling the unknown term.

Further explanation will be given in the instruction on involution and evolution.

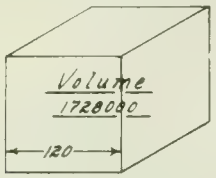
draw a straight line, a-b, equal to the sum of the two given terms and bisect (divide equally in two) at the point C. lines, or the point o, erect a line perpendicular to the line a-b, intersecting the semicircle at the point d. Then the line o-d will be a mean proportion between the two given values 8 and 18, and will be found by measurement to be 12 units in length.

As the elements of ratio and proportion will be considered continually throughout the course, we will not dwell on the subject at this time, but sufficient has been said to give one a fairly clear conception of the fundamental application as it affects shop problems, and a little thought will enable anyone to apply it whenever the necessity arises.

Involution and Evolution

An element that is extensively used in mathematical calculations is that of finding certain powers and roots of numbers, the processes respectively called involution and evolution. The power of a number may be found by simply multiplying the number by itself the required number of times; for instance, the second power (square) of a number is found by multiplying the number by itself, once. The third power (cube) by multiplying the number by itself, twice,

etc. The square of 3 would be 3x3=9. The cube of three would be 3x3x3=27. The fifth power would be 3x3x3x3x3=243. The cube of 120 would be:

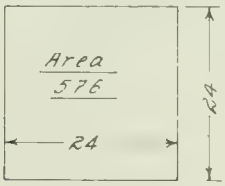


$$120 \times 120 \times 120 = 1728000$$

$$120 \times 120 = 14400$$

$$14400 \times 120 = 1728000$$

In nearly all engineering text-books brevity is the keynote of the contents. Rules and methods are invariably given in the form of symbols, characters and formulae for the convenience and ready reference of the readers, so that he is able to grasp the intended meaning without the long preamble of words and phrases. This, however, while being of vital importance to the experienced man, technically, is frequently very confusing to the young mechanic or student who has, for many reasons, been unable or perhaps unwilling to take the trouble to study the actual meaning and application of some of these apparently complex expressions. A little later we will endeavor to make clear the purpose of some of the various symbols and formulae that are often met with in technical and trade papers, and too frequently passed over by many readers as beyond their understanding. Very often a rule of phrase can be expressed by the use of a letter or figure placed in a relative position to the primary number. In working on involution the expression "the square of 9" would be abbreviated to 9^2, the small figure 2 called the exponent, placed to the upper right of the prime number. The square of 48 would be expressed:



$$24^2 = 24 \times 24 = 576$$

The principle of raising a number to a certain power is the same irrespective of the character of the number. Suppose the fraction ⅜ is to be cubed, the solution would be: $\frac{3}{8} \quad \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} = \frac{27}{512}$.

The expression ⅜ is placed in brackets to signify that the fraction is to be cubed. If the expression was ⅜, it would imply that the 3 was to be cubed, and the product divided by 8, so that care must be exercised in reading and expressing the figures. In the complex fraction:

$$\left(\frac{\frac{1}{2} \text{ of } 6}{3(6-1)}\right)^2$$

it is seen that the final result of the division is to be squared. In work of this description the easiest way is to simplify the problem by a process of calculations treating each section separately, gradually eliminating the brackets, always commencing with the smallest. The solution of the above would be:

$$\left(\frac{\frac{1}{2} \text{ of } 6}{3(6-1)}\right)^2 = \left(\frac{\frac{1}{2} \text{ of } 6}{3 \times 5}\right)^2 = \left(\frac{3}{15}\right)^2 = \left(\frac{1}{5}\right)^2 = \frac{1}{5} \times \frac{1}{5} = \frac{1}{25}$$

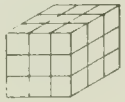
The reverse of involution, or the process of finding the root of a number that is considered a power, is called evolution. The square root of a number is the number that, when used twice as a factor, will produce that number. Thus, 5 is the square root of 25, because 5x5 =25. The cube root of a number is the number that, when used three times as a factor, will produce the number. Thus, 4 is the cube root of 64, because 4x4x4= 64. When the root of a number is to be extracted it is generally indicated by the radical sign ($\sqrt{}$) placed before the number, and a small number placed above the left of the sign indicating the root required. When used alone this sign implies that the square root is desired, and seldom is the index 2 used in calculations. A few examples will assist in showing the use of the sign:



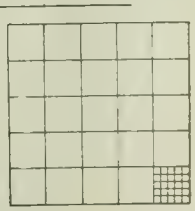
$\sqrt{4} = 2$ as $2 \times 2 = 4$



$\sqrt{36} = 6$ as $6 \times 6 = 36$



$\sqrt[3]{27} = 3$ as $3 \times 3 \times 3 = 27$

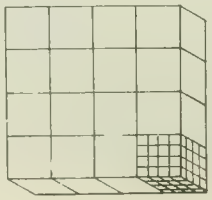


$\sqrt[4]{625} = 5$ as

$5^4 = 5^2 \times 5^2$

$5^4 = 5 \times 5 \times 5 \times 5 =$

625



$\sqrt[6]{4096} = 4$ as $4^6 = 4096$

$4^6 = 4^3 \times 4^2 = 4096$

In involution or the raising of a number to a certain power, the process is one of simple multiplication, but in finding the roots of numbers the calculations involved are more complex but comparatively easy once the method is understood, and as engineering practice requires a knowledge of root extraction a brief treatise may be of value to the younger element.

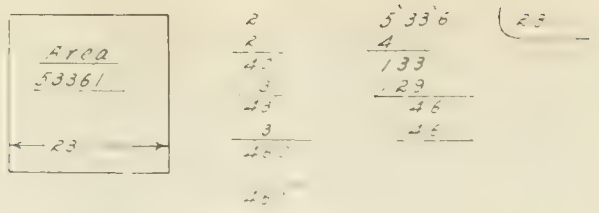
In evolution it should be remembered that the number of figures in the root will depend upon the power of the number. The square root will contain half the number of figures; the cube root one third the number of figures, etc. In other words the largest number that can be written with one figure is 9 and the square of it is 81, two figures. The largest number expressed with two figures is 99 and the square of it is 9801, four figures. Therefore, in extracting the square root of a number it is general practice to divide the number into periods, each period having two figures, commencing from the unit or right hand figure. Suppose we wish to find the square root of 53,361, the work would be performed as on page 575.

In explanation of the above it will be seen that the number is divided into three periods, signifying that the root will have three figures. The first detail is to find a number whose square is equal to or less than the number represented by the first period (5). This is found to be 2, and this will be the first figure of the root and is placed to the right of the number, as in ordinary division. This number 2 is likewise placed to the extreme left, and the product of the two placed beneath the first period of the number. Subtract the 4 from the 5 and bring down the two figures in the next period. Add the first figure of the root to the left hand column, obtaining 4 and multiplying this by 10 by annexing a cipher. This last result will be the trial divisor. Trying this into the new dividend (133) it is seen that it will go 3

times; this will be the second figure of the root. Add this to the trial divisor and obtain 43 as the true divisor. Multiply this by the second figure of the root and place the result beneath the dividend 133 and subtract. Bring down the figures in the next period and obtain 461 for the next dividend. Add the second figure of the root to the left hand column and annex a cipher, obtaining the trial divisor (460). The trial gives 1 for the next figure of the root, which, when added to the left hand column, gives the true divisor, 461, and this placed below the dividend completes the work, giving a result of 231 for the square root of 53,361.

From a little study it will be noticed that, apart from the increasing number of figures involved as the work progresses, the cycle of operations is the same for each period, finding the figure of the root by division, multiplying and subtracting and adding the next period for a new dividend, adding the last found figure of the root to the left hand column and annexing a cipher for a new trial divisor, and repeat.

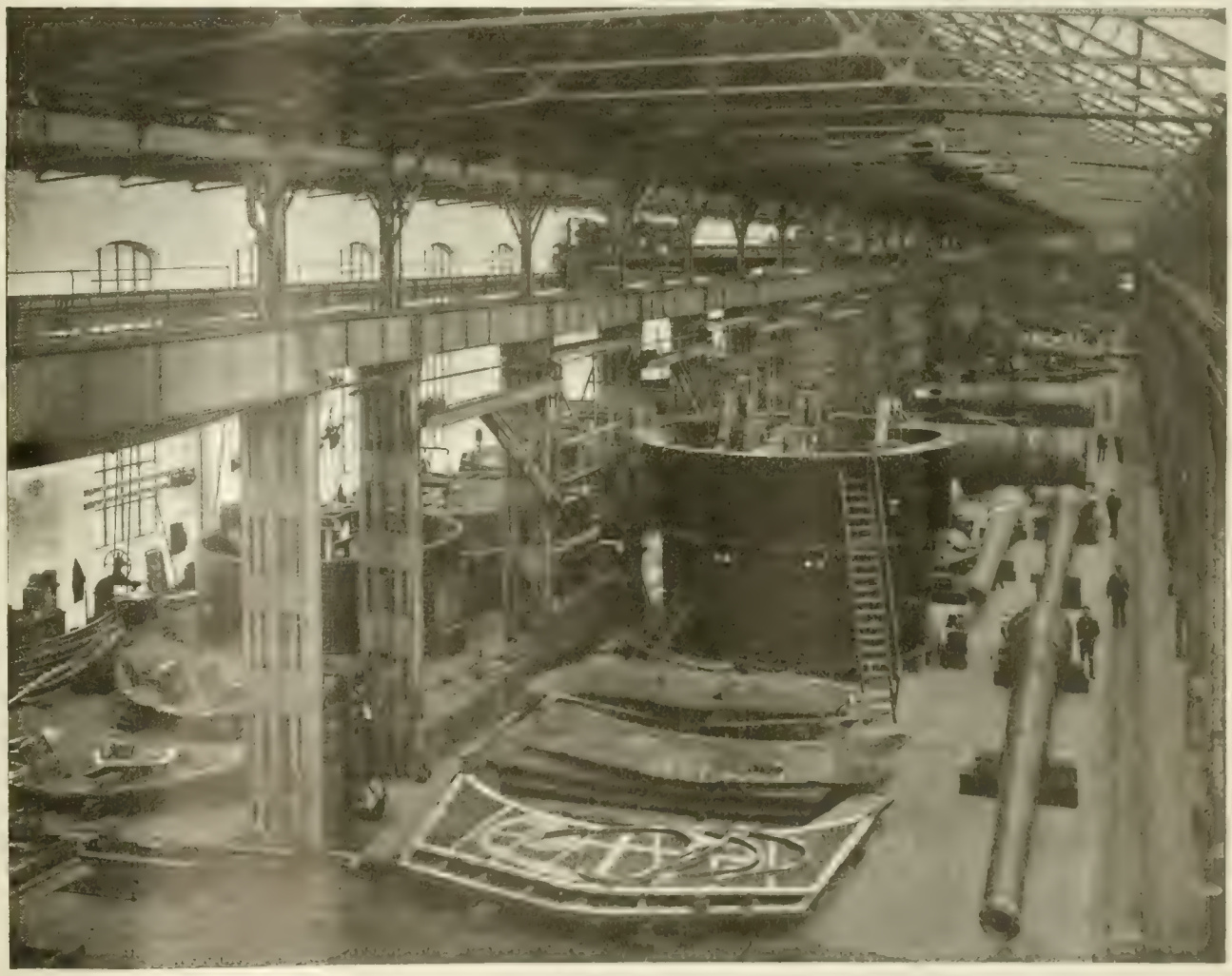
Extracting the roots of decimals is practically the same as for whole numbers, the periods of two figures each being always struck off from the decimal point. When ciphers appear care should be taken not to destroy the value of the numbers.



WHY DO PROPELLERS CORRODE?

For a long time it has been a mystery why steamship propellers, especially those of fast vessels, become pitted over a portion of their surface. At first it was thought that the metal was corroded by the action of the sea-water, but a more satisfactory explanation has been found by a sub-committee formed in 1915 by the British Board of Invention and Research. Every high-speed propeller produces what is called "cavitation" in the water; roughly speaking, it bores holes in the water. Violent eddies are apt to form in the cavitated region, especially if the propeller is revolving in water disturbed by the action of other propellers or by portions of the stern frame, and these eddies are liable to collapse suddenly, throwing the water against the propeller with a hammer-like action. Calculations made by the sub-committee showed that the weight of the blow might be several tons, or even hundreds of tons per square inch. Little wonder, therefore, that holes are knocked in even the toughest phosphor bronze. Confirmation of this theory is supplied by the fact that on a fast cruiser the bearings close to the propeller resound with a deafening noise like a million pneumatic riveters. Now that British science has discovered the cause of this phenomenon, British engineering will not be slow to work out some means of removing the trouble, which can be done partly by alterations in design and partly by adopting slower propeller speeds to reduce cavitation.

New Hydro Rates. — The Ontario Hydro Commission have issued the new rates which give a reduction in power and street lighting rates, but none on domestic lighting. A further effort is being made to effect a reduction on the domestic lighting rates as well as the industrial.



GENERAL VIEW OF THE GUN MOUNTING SHOP AT MESSRS. VICKERS, LTD., SHEFFIELD, ENGLAND.

The Use of Jigs, Tools and Special Machines

Being an Article on Jigs, Tools and Special Machines, With Their Relation to the Production of Standardized Parts. A Study of This Article Will Prove Well Worth While

By H. C. ARMITAGE*

(Continued from May 22nd issue)

Scheme for Large Production

THE jigs which are now to be described have for their object the production of an average of 20 rods per hour and will represent in their construction the nearest it is possible to get to continuous cutting without the aid of special machines, and using standard machine tools.

Mill Both Ends of Connecting Rod (Fig. 11)

There are four cutters used with this jig, and it should be noticed that the method applies whether the small boss of the connecting-rod is wider or narrower than the large end. The cutters are fed up to the rods in the same way as in the jig described in the smaller scheme, and after having taken the cut, it is indexed round through 180 deg. The general disadvantage of jigs of this type is that very exact workmanship is required in order to achieve accurate results, as a small inaccuracy in their alignment is magnified in the work. Owing to the height of the work above the machine table, a special construction has been arranged to obtain the necessary stiffness. The base-plate is built up in the form of an internal taper-sleeve, inside the indexing portion, which takes the entire thrust of the cutters. Clamping in position is effected by means of a "tommy bar" in the base of the structure. Additional support is given by the annular slide strip which goes right round the revolving portion. To obtain the maximum production, two jigs would be mounted upon the table of one machine, with the cutters in between the two jigs. It would mean alternate directions of feed for the table, and in one case the cutters would have to cut upwards; with the stiff construction shown, it should, however, be possible to obtain accurate work. One jig would be loaded whilst the cutters were at work on the opposite fixture, but it is questionable whether a jig of this type is preferable to three or four jigs which could split the operations up into their simplest parts. By doing this, there would be no approach to continuous cutting, but the actual time of operation would be very much reduced.

Drill Small End of Connecting Rod (Fig. 12)

This jig will drill four connecting rods at once, with the minimum of trouble in placing them in the tool. While they are being drilled on one side of it four other connecting rods are being loaded on the other side. In some drilling machines it is possible to move the table lengthways to fixed stops so that the screw and hand wheel which are here embodied in the jig will not then be necessary. It will be observed that the bushes are moved up and down in a very rigid guide by means of a long handle which will be sprung down against a latch at the end of the handle. This form of construction is better and quicker than the screw-down bush. This spring in the lever should be sufficient to hold the handle up to the latch. In

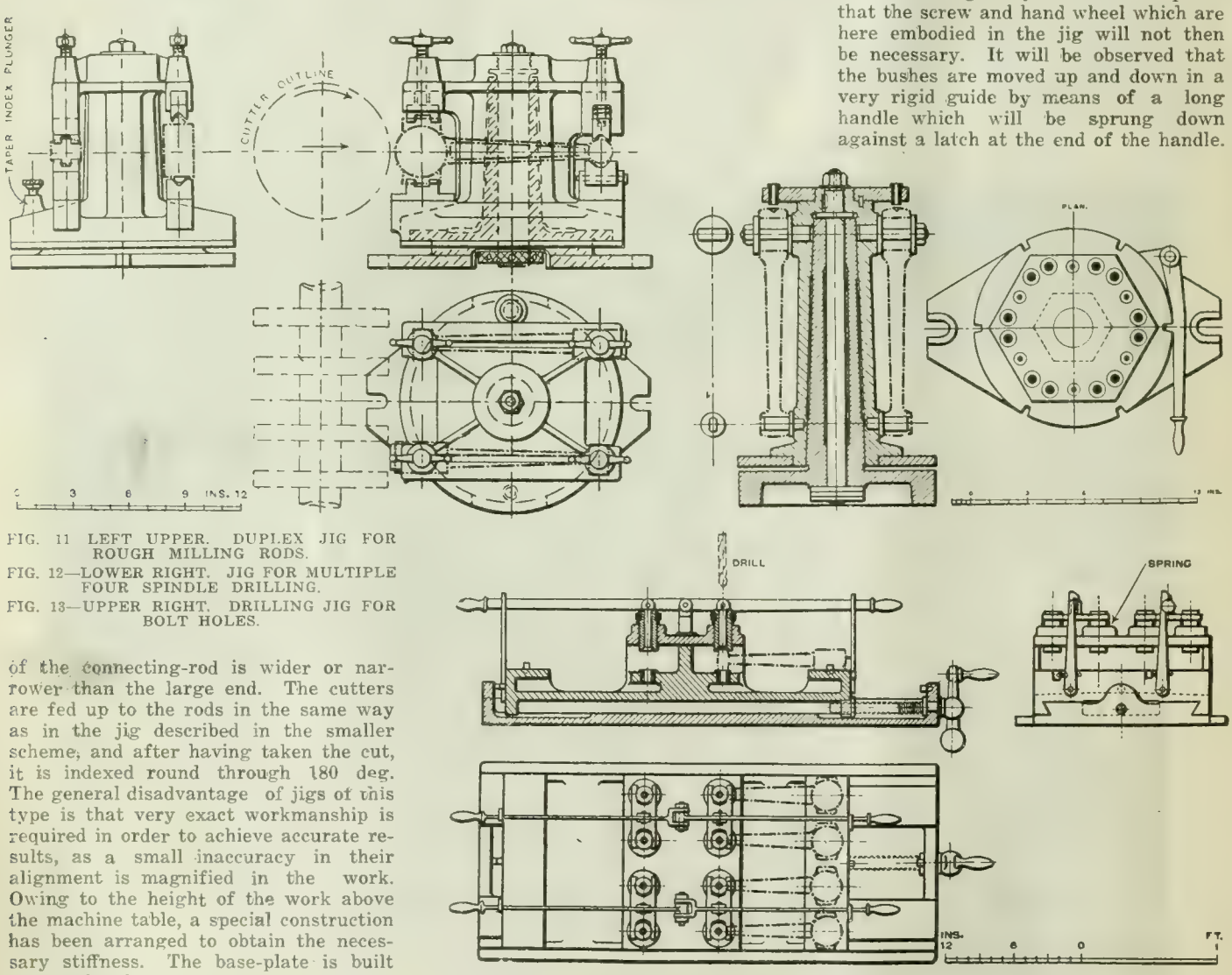


FIG. 11 LEFT UPPER. DUPLEX JIG FOR ROUGH MILLING RODS.

FIG. 12—LOWER RIGHT. JIG FOR MULTIPLE FOUR SPINDLE DRILLING.

FIG. 13—UPPER RIGHT. DRILLING JIG FOR BOLT HOLES.

*Paper read before the Institution of Mechanical Engineering.

the illustration the holes are perhaps shown closer together than would be practicable, but this makes no difference to the essential design of the jig.

Drill Large End of Connecting Rod

This jig is practically the same in design as the previous one, except that the connecting rods would be positioned from the small hole. These two last-named jigs represent the nearest that can be obtained to continuous drilling without the aid of special machine tools, but each of them will keep one man per machine fully occupied in loading and unloading one jig.

Drill Bolt Holes and Centre End of Connecting Rod (Fig. 13, above)

This jig is intended for use in a multiple spindle drilling machine, and there should be at least four drilling spindles and two centering spindles at work at once to effect any economy. The jig will be indexed round by hand, and the sleeve support construction is again worthy of note.

Mill Sides of Connecting Rod

This operation will have to be done in practically the same manner as the one shown in the last scheme, but it is possible that economy might be effected by putting six or eight rods in a line, and running a facing cutter across them at the full width of the surface between the bosses. There would, however, be difficulties in giving an adequate support to the middle of the connecting rod, without complicated construction. Separate carriers to be loaded whilst the cut is in progress should be provided.

Finish Boring Large Hole

The remaining operations are the same as in the first scheme, except that the finish boring should be done on a heavy gap bed-turret lathe of the "Gisholt" type. Also the finish boring for white-metalling will require an equally substantial machine in order to get the swing necessary, but would have a disadvantage in rendering back-gear useless on account of the speed required. There is one method however in connection with the finished boring that might result in economy, and that would be to bore the connecting rods on a drilling machine by means of a single inserted tool piloted boring bar, then changing the bar, putting in a recessing tool holder and finishing off with a reamer. The accuracy of the finished boring is not of vital importance when the connecting rod has to be white metalled, and if the finish is slightly rough it will make the white metal hold even better. The practice is not to be recommended if turret lathes are available.

Scheme for Maximum Production

In this scheme it is proposed to investigate the possibilities of continuous cutting with special machine tools and the lay-out is given in Table V.

Mill Ends of Connecting Rod

There are two vertical spindles, and the internal cutters will move in the smallest circle possible. The machine will not have to be stopped for loading,

Operation No.	Description of Operation.	Fig. No. of Jig.	Time Req. Minutes per Piece.	Type of Machine.	No. of Mach.	Labor Cost per Piece
1	Heat treatment					
2	File burrs, etc.					
3	Continuous mill both ends of rod	Becker miller	1	2-spindle circular miller	10	
4	Continuous drill both ends of rod	11	1	4-spindle auto. drill	10	0.2
5	Broach small end		1	Broaching	1	0.1
6	Continuous drill and centre	1	1	2-spindle double drill	1-2 head	
7	Continuous mill sides of rod	10	1	Duplex continuous miller	1	0.2
8	Mill across top of bolt holes		1	Horizontal miller		0.9
9	Mill sides of bolt faces	12	2	Duplex vertical miller	2	0.4
10	Part cap		1	Horizontal miller		0.9
11	Finish bore large end		6	Turret lathe	10	3.3
12	Run white metal in large end					
13	Finish bore white metal in large end		10	Turret lathe	10	1.6

and there will be a continuous production from the machine. Unfortunately, when continuous cutting is adopted, there are several disadvantages, the principle one being that of getting the cutter to stand up effectively to the work. A machine of this description is usually more powerful in strength and feed than can reasonably be expected from the cutters. Also since the best of cutters will become dull in four to five hours, there is a considerable waste of time in changing them, and several spare sets must be kept in readiness. Assuming that the machine tool turns out connecting rods at the rate of 60 per hour, and that there is a stoppage of work for 30 minutes at the very least, to change cutters, it means a loss of about 40 connecting rods during that time. Considering that this will take place twice a day, it makes a very serious drawback. There is usually a similar trouble experienced in holding the pieces in continuous milling, as in multiple-operation machines. In the engravings, on this page, there are shown illustrations of a Becker double spindle continuous miller set up on connecting rods, where the design of jig employed is decidedly ingenious. The Becker Co. claim that they can mill up to 90 connecting rods per hour, but the output must depend mainly on the degree to which the rods have been previously annealed and pickled to remove scale.

Continuous Drill Both Ends of Connecting Rod (Fig. 14.)

This figure shows in outline a four-spindle drilling machine and no pretense is made that the manchine is proportioned correctly. Upon the table there are four pairs of connecting rods. The saddle feeds down to drill the holes, the cut is automatically released, then it traverses upward quickly to clear the work. In the meantime, the tables indexes round a quarter of a turn, and two more rods are brought into position for drilling. The saddle again feeds downwards, and by this cycle of operations, continuous drilling is very economically obtained. It should be

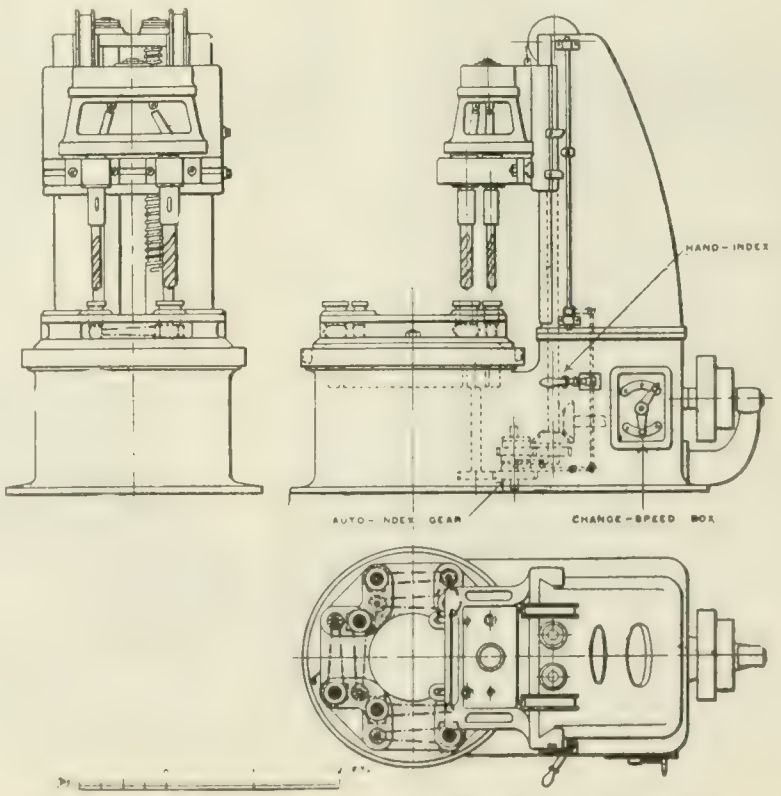


FIG. 11 FOUR SPINDLE AUTOMATIC DRILLER FOR EIGHT RODS.

quite possible for one man to mind two or even three machines of this type, and this is where the real economy of highly specialized machine tools come in, otherwise there are few advantages worth mention. It is worth noting that a machine of this type can be used for any number of similar jobs, and should therefore not be any loss or even stand idle in a manufacturing works, which has connecting rods of any description to make. It is very surprising indeed to notice that few of the larger type of machine tools automatically index the work into position. Possibly a really first-class and powerful index mechanism has to be designed, although the principle is fairly well established in automatic screw machines and gear cutters.

Continuous Drill Bolt Holes and Centre Rods (Fig. 15)

This machine is practically identical in principle with the one previously described, except that the spindles are horizontal. The indexing will be for a larger number of rods, and the spindles, saddles and index motion are driven by means of an electric motor. In practice it will be found very likely that another head can be placed on the other side of the machine, thereby getting double the output. It would be necessary, however, to drive the drills in the saddle from the same motor.

Continuous Mill Sides of Rod (Fig. 16)

In this machine, of which a plan only is shown in the drawing, there are two substantial face-milling heads. The connecting rods are arranged radially on a circular frame, which is driven around at the correct feeding speed. The whole machine is driven by an electric motor, and the rods are loaded in on the opposite side of the machine while revolving. There is a doubtful economy, however, in continuous milling of this description, as the rods would have to be spaced some considerable distance apart. For instance, if the metal between them is only 1¼ in. and the rods themselves ¾ in. wide, it means that a cut has to be taken over 2 in. in order to mill ¾ in. Supposing that the rate of feed is 1 in. per minute, it will be seen that the effective continuous milling feed obtained is only ¾ per minute. This is true of any continuous milling operation, and it is doubtful whether the application shown is worth the results obtained. In this machine some support would have to be given in the middle of the connecting rod to prevent excessive chattering. Compressed air operated clamps and jig stops will prove very useful in this respect, and will greatly reduce the time in fixing the work.

Milling Across Bolt Hole Bosses and Faces

It is practically impossible to "continuous mill" across the top of the bolt holes, except by a profiling motion, and this will necessitate a complicated machine. For milling the sides of the bolt faces a duplex vertical spindle milling machine would be very effective, and almost continuous milling action could be obtained with very little trouble. The diagram of this is shown in Fig. 17. It is strange why this type of machine is not more popular, as it undoubtedly has a very wide field of usefulness for any description of rods, or repetition work which requires milling at both ends.

Finish Boring on Special Machines

There is little to be gained by building a special machine tool for finishing boring the large end, and up to the present date nothing better than the turret lathe has been found. So far as the author knows there has been no effective method yet devised for obtaining accurate continuous boring action, because this can only be obtained by revolving the tool. It is the universal practice to revolve the work where its size permits and feed the tool. If it were possible to obtain accurate results by means of a revolving cutting tool, combined with a turret, continuous action would be easily obtainable.

Comparative Results Between the Three Schemes

By totalling up the machine tool values, expenditure in jigs, and the labor costs, the following results are obtained, in spite of the fact that a connecting rod does not lend itself exceptionally well to manufacture by special machine tools (see Table VI).

The figures are somewhat startling and show that an approximate trebling of production reduces the manufacturing cost in each case by about one-half. Other charges (which have not been shown), such as management, power, establishment, etc., will be practically the same in each case. By referring to the operation tables it will be seen that in each scheme the same finishing methods are

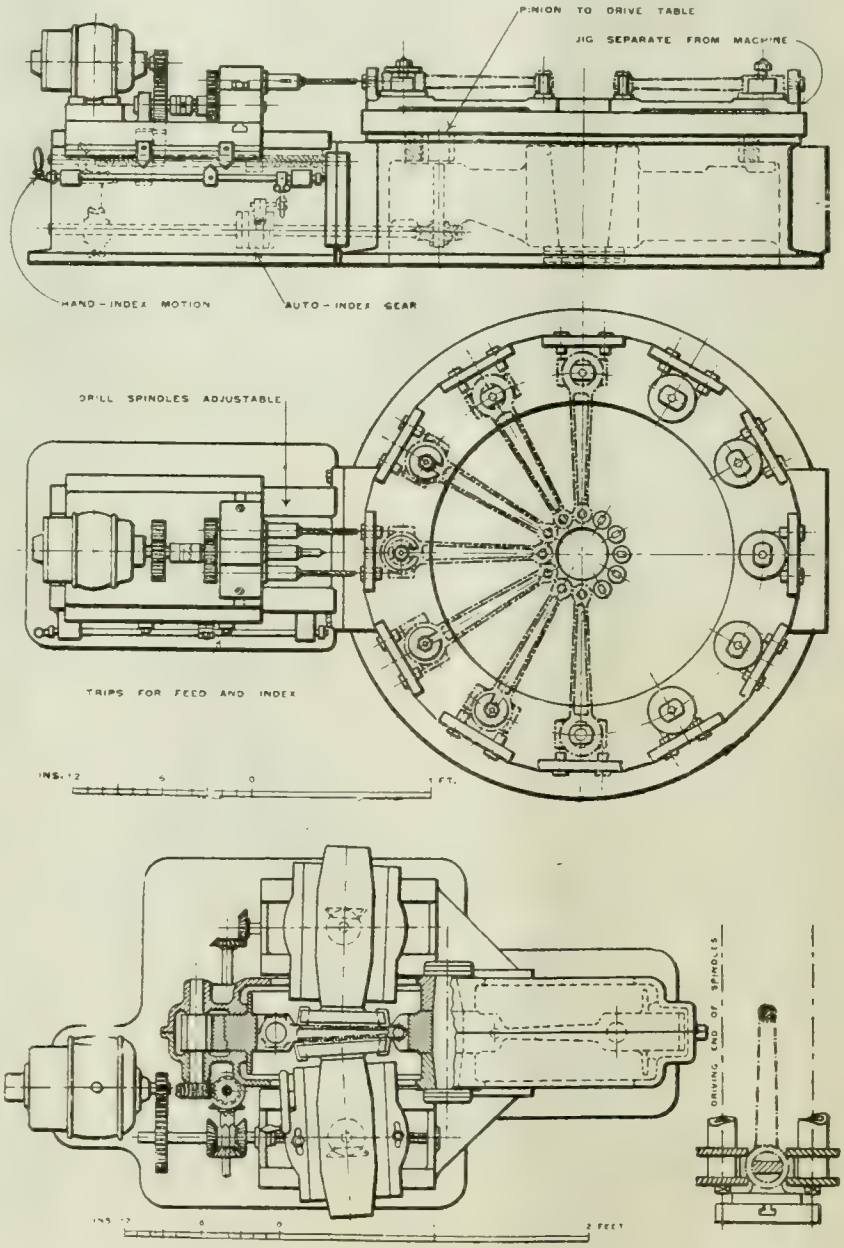


FIG. 15—CONTINUOUS DRILLING MACHINE FOR BOLT HOLES.
FIG. 16—CONTINUOUS MILLING MACHINE FOR SIDES OF CONNECTING ROD.
FIG. 17—DIAGRAM SHOWING DUPLEX VERTICAL MILLER FOR FACING BOLT HOLES.

to be employed, namely, the turret lathe. Where, in the small production lay-out, two lathes are required there will be 20 necessary to cope with the largest output. The great economy shown, therefore, will be tremendously accentuated if special finishing machines could be employed. Under each scheme a properly balanced plant has been assumed. If there is an output of less than the maximum per week the working costs will be increased, as part of the machines would be idle.

TABLE VI.

	Small Production	Large Production	Maximum Production
Weekly output	300	1,000	3,000
A Total number of machine tools involved	16	84	47
B Operator's wages (say 10d. per hour), per one rod	2/ 9d	14.5d.	7.7d.
C Setters-up wages (say 1s. 8d. per hour), per one rod	1s 0d	6.0d.	0.25d.
D Total approximate value of jig required	225l	855l.	1,260l.
E Total approximate value of machine tools	2,400..	5,850l.	9,200l.
F Weekly cost of plant upkeep, say, 10 per cent. depreciation, 5 per cent. interest on capital	7.9d	20.1d.	29.4d.
G. Plant cost per rod.	6.3d.	4.8d.	2.3d.
H. Total cost of rod. (Sum of B.C.G.)...	50.2d.	25.3d.	10.25d.

Figures for the wearing tools (that is, milling cuttefs, drills, broaches, etc.), costs have not been added, as they will be almost proportionate to the output. There is sure to be a slight reduction per connecting rod in the large productions, for by manufacturing or buying in large quantities they should be obtained at much lower prices. The figures have been set out in the form of a curve in Fig. 18.

Lines of Future Development

In conclusion, a few notes must be added regarding the future developments of tools for interchangeable and repetition production. The war has only thoroughly awakened us to the huge possibilities of accurately working to standardized dimensions and given limits for component parts. It is doubtful, though possible, that, before the war there was an English motor car built with absolutely interchangeable parts. It is a certainty that motor cars not built on interchangeable lines will cost such a price after the war that the maker will not find a market for them. This will apply to everything of a similar nature, and since standard ships are now an accomplished fact, standardized houses, motor cars, auto carriers, typewriters and domestic machinery may be expected in this country. This being granted, the importance of special and precision tools will be enormously increased. Reliable and standard limit systems both of first degree for manufacturing and of a second degree for tools, to suit modern methods, and for all classes of work, must be framed, from the experience gained in the use of the several existing systems, all of which are far from perfect. Further, skilled labor will be very scarce, and since our industrial success depends upon an abundance of special tools, improved and quicker means must be devised for making them. During the war we have learnt how to make screw-gauges almost on repetition lines. Surely the same concentration might be exerted upon precise methods of locating and boring holes for jigs or other precision work. Imagine, for instance, an optical measuring or spacing device, and a method of boring holes to within half a thousandth limit in the centre distance without revolving the work. This is again the plea for a means of accurate machining with a revolving tool, for having once obtained accurate precision cutting by a revolving tool, a jig-bush hole boring machine with micrometer and vernier settings to bore in several planes at once, and capable of being set up in a few minutes, would soon be a feature of every tool-room. Again, there is considerable scope for investigation in the methods of hardening high-speed and tool steels without deformation of the

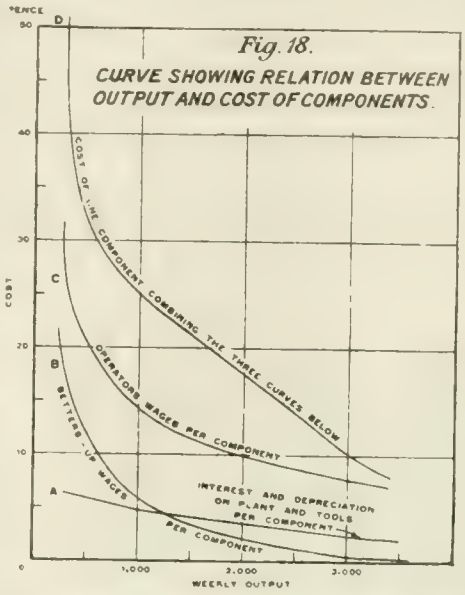
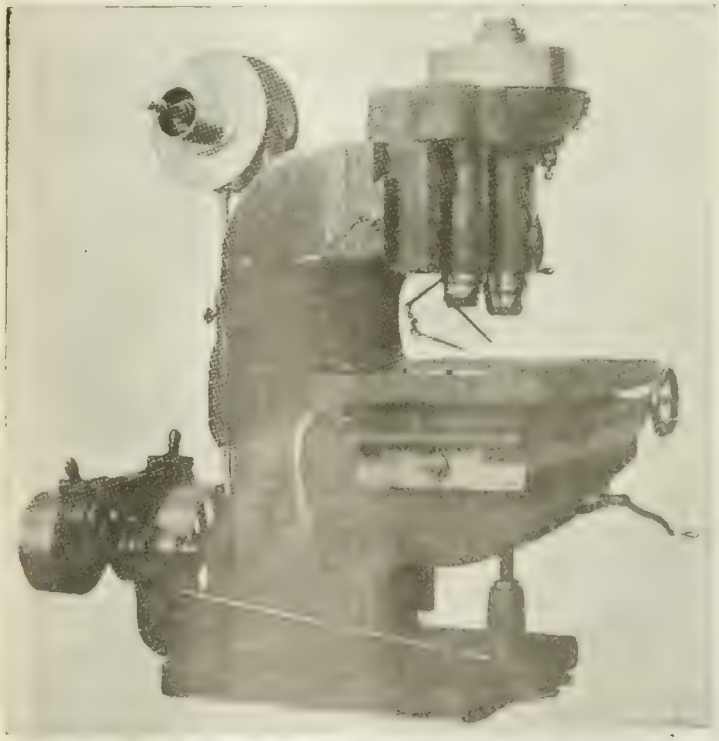
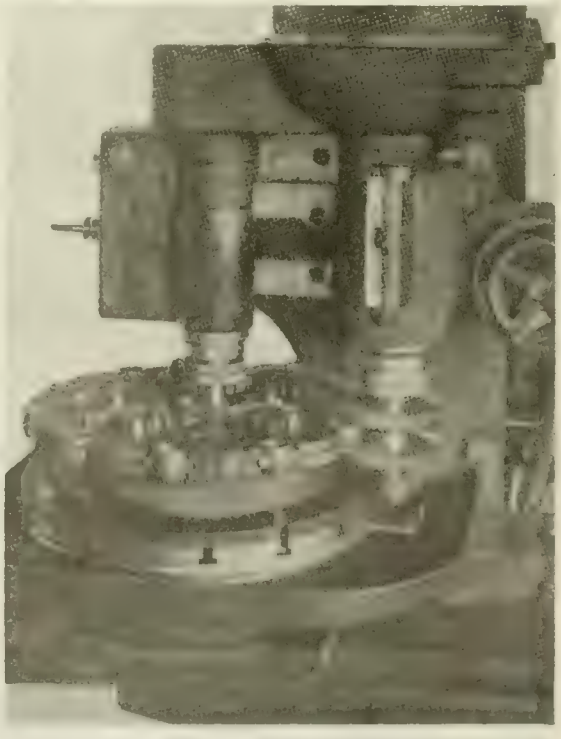


Fig. 18.
CURVE SHOWING RELATION BETWEEN OUTPUT AND COST OF COMPONENTS.

FIG. 18. DIAGRAM CURVE OF OUTPUT AND COSTS.



GENERAL VIEW OF BECKER DOUBLE SPINDLE CONTINUOUS MILLER.



VIEW SHOWING THIS MACHINE MILLING 100 CONNECTING RODS.

metal. It is safe to state that if steel-makers do not produce non-shrinking and non-warping steels, progress can only be obtained by greater perfection of the grinding machine and its wheels, and extending considerably the use of formed wheels.

One of the greatest manufacturing troubles now experienced on aero engine parts is in the nickel-steel case-hardened parts. Several heat treatments are usually necessary, and even then, after hardening, the component usually twists and distorts out of shape or increases in size. This will undoubtedly develop grinding processes rapidly and considerable ingenuity has to be given to the order in which operations are to be performed between carbonizing and quenching the piece.

The whole tendency of tool design is in the direction of more "fool-proof" jigs, therefore making more complex and larger jigs necessary. If this can be done with a degree of standardized tool parts, and with easier methods of producing precision work, to avoid trial and error settings when building the tools, there need be no fear for the development and increase of engineering production for the next few years to replace war wastage.

The Portable Electric Oven and its Uses

An Article Describing the Uses of These Ovens, Together With Interesting Photographs of the Same

By B.S.B.

IT is a well-known fact that many concerns have small pieces of work completed in different parts of their factory which have to be dried, japanned or enamelled before going on to the next stage of manufacture or assembly. Where production is small these pieces are usually taken to a special department, treated and then put back into the cycle of manufacture. This necessitates extra carting and hauling, loss of time, and is inconvenient. In other words, it is not an efficient or scientific method of handling the work.

Fig. 1 shows a portable electrically heated oven used for drying fibre and japanning small parts at the Philadelphia Switch Factory, Philadelphia, Pa.

The oven is 1 ft. 6 in. wide, 1 ft. 6 in. high and 5 ft. long, with a heating chamber 10 in. high underneath the floor of the oven. General Electric heaters totalling 4.72 kw. are installed in this heating chamber, and are controlled by means of snap switches, Figure 2, so that four heats are obtainable, drawing 4.72, 3.94, 3.37 and 2.95 kw. respectively. The heating equipment, in this case, is designed for operation on a direct current circuit at 250 volts.

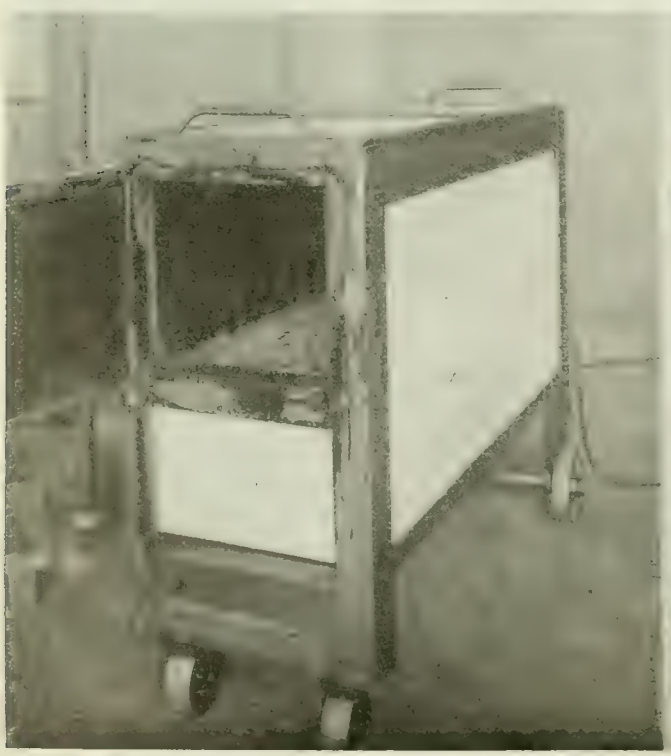
Fibre strips are dried in the oven at a temperature ranging from 200° to 250° F. By means of the snap switches it is possible, after the work has been brought up to the desired temperature, to provide just enough heat to take care of the losses due to radiation and ventilation, the oven, therefore, requiring little attention. (However, automatic temperature control, in most cases, is desirable, as it gives a more positive and flexible temperature regulation.)

For fibre drying the electric oven is the best. If the temperature rises too high, as is liable to be the case in a gas, steam or oil heated oven, the fibre becomes dry and brittle and is hard to work with. Electrically generated heat with the consequent close control of temperature provide ideal working conditions.

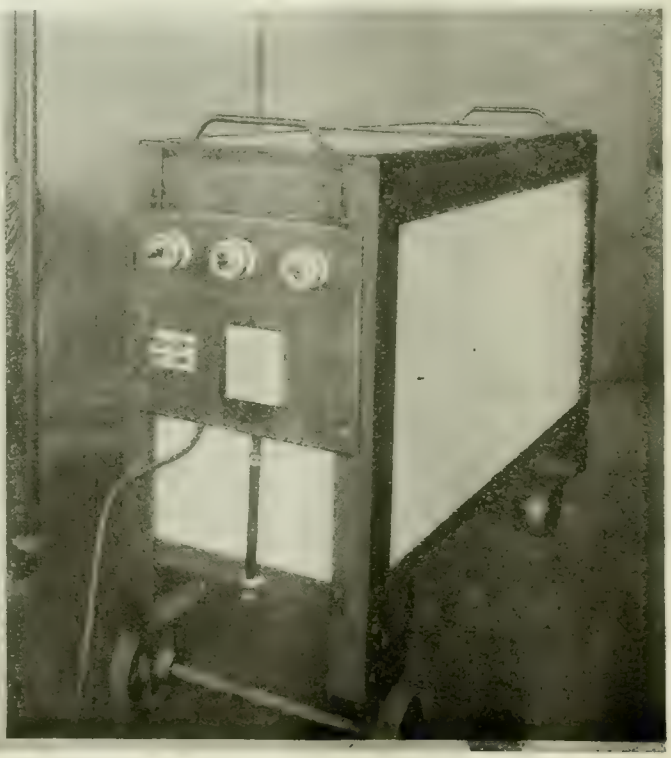
This oven is provided with ventilation, so that it is adaptable to japan baking and enamelling. It is sometimes used for impregnating small coils with waterproofing and insulating material.

The portability of this oven has time and again proved to be a great convenience and saving. One man can easily push it around from one room to another, and elevators make it equally useful on any floor in the building.

It is, of course, conceivable that gas, oil or steam could be used to heat this oven, but it is not practical. The difference between connecting up gas or steam pipes, carrying tanks of oil and compressed air along with the oven and merely connecting up the oven by means of a set of electric wires is obvious.



FRONT VIEW OF PORTABLE FIBRE DRYING OVEN.



REAR VIEW OF PORTABLE FIBRE DRYING OVEN.



WELDING AND CUTTING



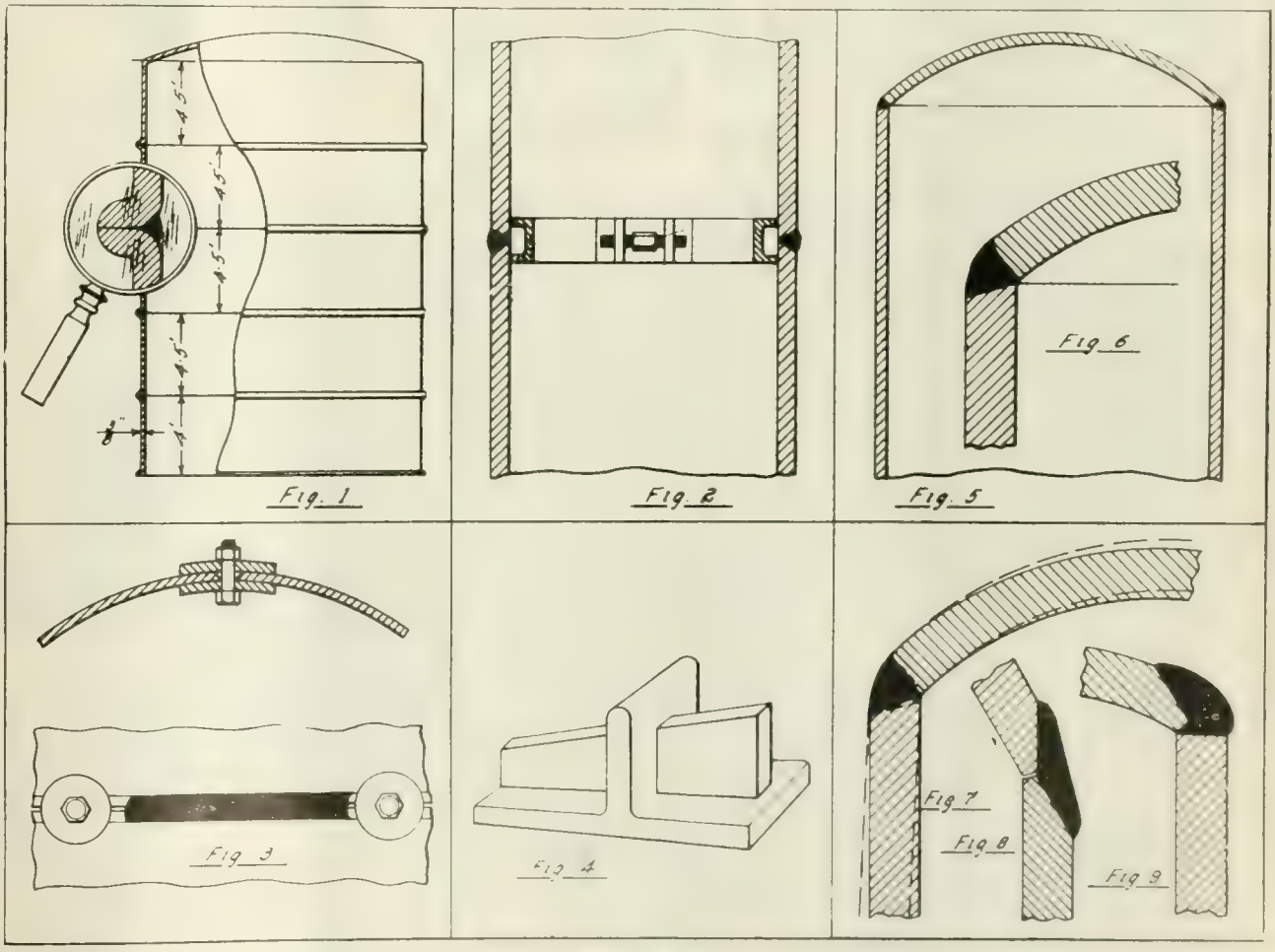
Welding Performed on Cylindrical Bodies

An Article Covering the Welding of Seams, Also the Welding of Head and Bottom Into Cylindrical Bodies

By ERNEST SCHWARTZ*

Welding of Seams

IF sections of cylindrical hollow bodies are to be connected together, a welding can be successfully produced on light gauged material by first beading the edges and then welding. In Fig. 1 a larger body is shown, which was produced in such a manner. If cylindrical bodies are of heavier gauge material, it is recommended to span the edges of the two sections from the inside by means of a U-shaped ring, which operation is clearly shown in Fig. 2. The expansion of the said ring is operated in the easiest way by the following construction of the device:



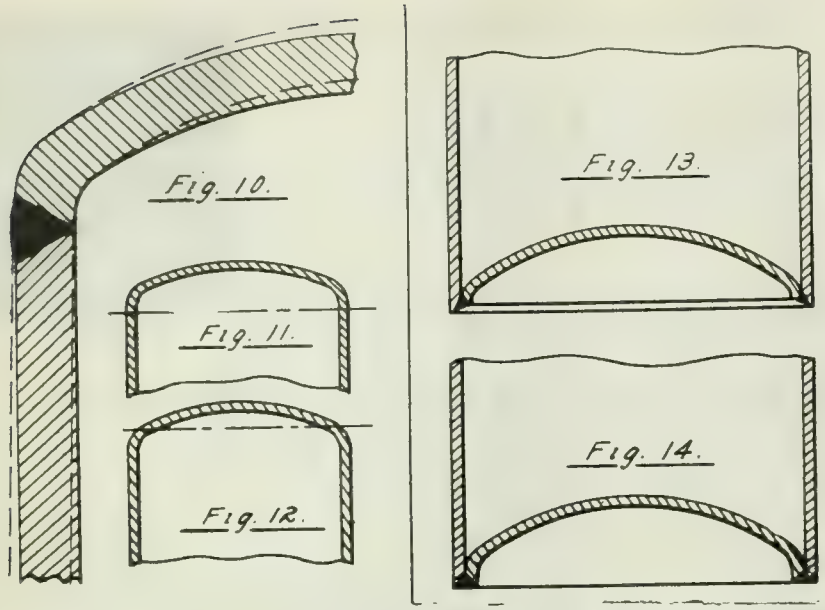
FIGS. 1 TO 9

The trustends of the ring carry flaps, in which a feed screw is located, which has in its centre a hexagon screw head, by means of which is effected the expansion of the tension ring.

On welding operations of this kind it is advantageous that the edges of the metal do not touch each other, to give enough play for expansion due to the heat.

An advisable assistance in producing a good welding job is the way in which the edges of the sections to be welded are held together, and is shown in Fig. 3. Washers are placed in certain intervals, about 8 inches, to the full length of the seam to be welded, in which case the bolts will secure the space necessary for expansion of metals. The welding

*NOTE.—Owing to a typographical error, the heading as above was used on another article run in this section. The heading in last issue should have read, "Repairs to Boilers and Engines by Welding."



FIGS. 10 TO 14.

is then performed in the free spaces between the washers. After this preliminary operation, washers and bolts are removed and the remaining spaces welded. Another very suitable device is shown in Fig. 4, and consists of short pieces of T-iron, in which a slot is cut to accommodate a flat-iron wedge. The sections to be welded are held between the lower leg of the T-iron and the wedge, and are clamped firmly together. This small device can be easily removed by knocking the wedge out with a hammer.

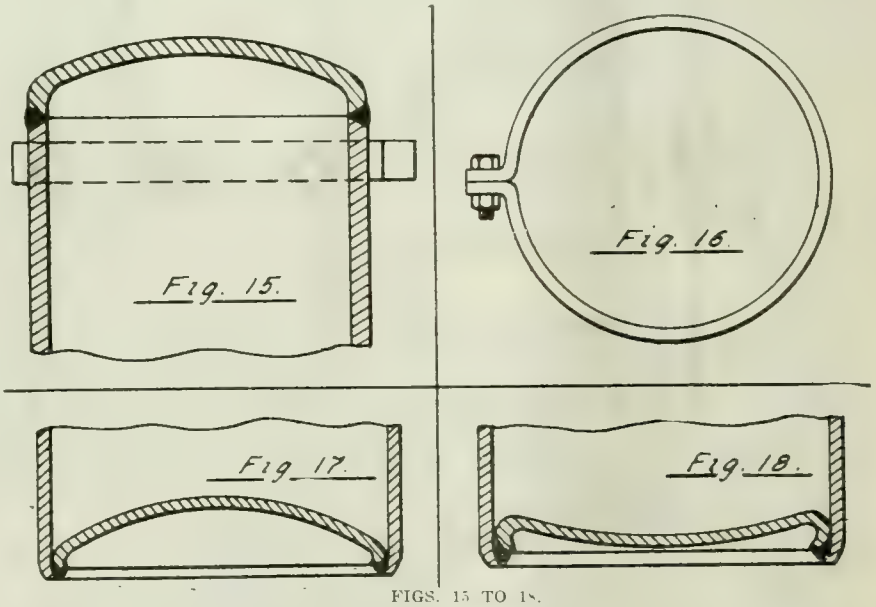
Welding The Head and Bottom Into Cylindrical Bodies

In the beginning of the autogenous welding industry they were looking for the simplest process in the manufacturing of receptacles of circular shape, to connect the head and bottom to the cylinder wall. These parts, for instance, would be placed in such a way on the cylinder that the edges to be welded came between the cover and the cylinder wall. This kind of welding a seam showed many disadvantages in regard to the strength of the weld. For such receptacles, if they are not subject to inner pressure, a seam of the kind shown in Figs. 5 and 6 will prove satisfactory. On vessels which are subjected to inner pressures, a connection of this kind cannot be found correct and free of objections in accordance with the present rules of design. If a hollow body has to stand big inner pressure it will have the tendency to expand not only at the cylinder walls, but also at the head, in which case the cylindrical vessel will be inclined to take the spherical form. The welding on pieces of this kind is performed from the outside, hence the edges of the cylinder and its head, which are held together by a different binding material, will be the weakest part of the whole body. The stress at this particular part is far bigger than at any other part of the sheet metal. At a welding connection of this kind various stresses will occur in the material of the welded seam as shown in Fig. 7. A weighty inner pressure, which will always cause a change, will lead to the fact that from the inside a pulling force or tension and from the outside a pressure will be caused at the welding seam. This uneven distribution of forces will lead in course of time to the formation of cracks, which will tear always further by continuous working, until the entire head will tear off.

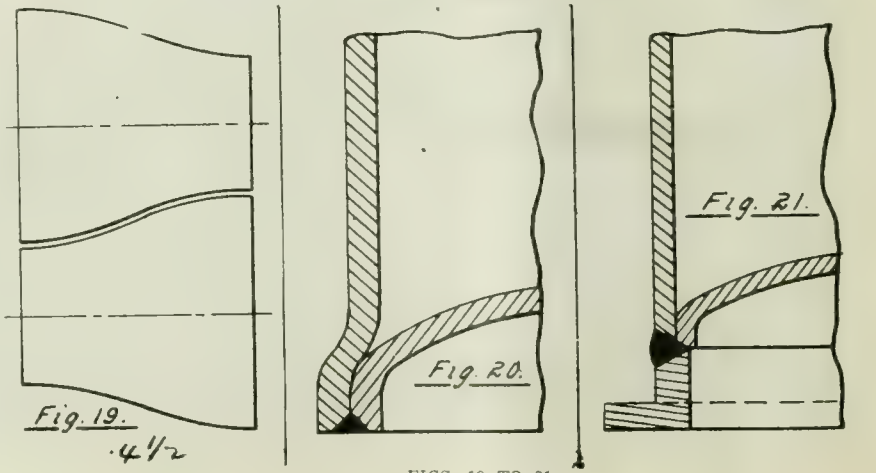
Two incorrect welds are shown in Figs. 8 and 9. In these instances, the operator doing the job only melted the top layer of the welding material without going through the entire depth of the same. On these spots, which are exposed to an inner pressure, the parts of the material not connected by welding will lead to fracture.

The correct way of welding the head to the cylinder is shown in Fig. 10. The biggest stress is then not in the welded seam, but is uniformly distributed over a certain portion, shown in Fig. 11. Another kind of the execution of such a job is illustrated in Fig. 12. The cylindrical wall is heated with a torch or any other means and then shaped with a hammer or beading machine to fit the form of the head. In this case the head has to be cut smaller, to fit over the beaded opening. After bevelling the edges the welding is performed from the outside.

In welding the bottom into the cylinder, the edges of the bottom will be extended slightly over the edge of the body, Fig. 13. In Fig. 14 is shown another way of doing this particular job satisfactorily.



FIGS. 15 TO 18.



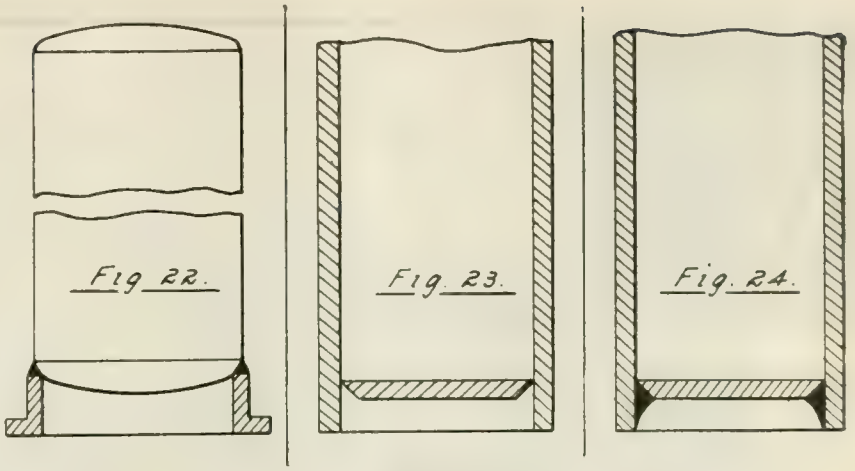
FIGS. 19 TO 21.

To give the cylinder more strength while performing the welding, a heavy ring is fastened below the welded seam, Fig. 15, by which the heat in the metal is stopped from distributing over a section which is near the welded seam. The easiest way of making a ring of this kind is shown in Fig. 16.

Figs. 17 and 18 illustrate the welding of bottoms into cylindrical receptacles, which show extraordinary advantages in regard to resistance to corrosion, which usually affects the welded seam on account of the free location. After heating the cylinder wall and the previously inserted bottom, both parts are beaded to the inside, so that the cylinder wall can resist to an inner pressure.

The profile roll, Fig. 19, is used in shaping the lower cylinder end, making a wide rim to fit the bottom part, shown in figure 20. If it is necessary to attach to the bottom a ring of angle iron, the latter can be welded to the cylinder wall in the way shown in Fig. 21. These rings prove advisable for the reason that the welded seam does not come in contact with the moisture on the floor of the room, which will avoid corrosion. Fig. 22 shows a modified application of the above described foot ring.

The ends of cylindrical bodies of smaller diameter, such as pipes, can be supplied with a cover in a manner shown in Figs. 23 and 24. A piece of heavy gauge metal is cut to fit the inside diameter of the pipe and is then welded.



FIGS. 22 TO 24.

In welding performances of this kind on work of cylindrical character, the fundamental principles described above will prove of distinct value to the welder.

PURIFYING CRUDE GLYCERINE

By L. P.

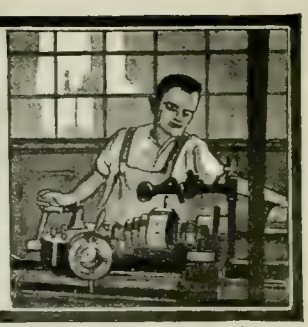
Crude glycerine is purified by esterizing it in the known way, with an organic acid, whose glycerinester is insoluble in water, either in the absolute absence of water or in the presence of condensing media, following which is the ester in purified and split, and finally, in the glycerine water obtained, as the case may be, either concentrated or distilled. It is not rare that crude glycerine contains such quantities of inorganic and organic impurities that the direct distillation of glycerine becomes impossible. If, e.g., fats strongly decomposed have been used in the preparation of glycerine, and make the latter impure in so high a degree that a distillation is absolutely excluded. The percentage of albuminous substances makes the distillation, further, either very difficult or totally impossible. The process here given makes the refining of glycerine also in those cases possible.



ROLLING RAILROAD TYRES AT MESSRS. VICKERS, LTD., SHEFFIELD, ENGLAND.



WHAT OUR READERS THINK AND DO



NEW FORMULA FOR STUB GEARS

By Ernest Bell

Editor's Note: Before going on to the description of this formula let us quote a portion of the letter which came with this suggestion for our "Made by Our Readers' Section."

"I am sending in a little formula which I think is original as I have worked it out myself. I hope I have made myself quite clear. This is my first attempt at writing for your paper, although I have been taking CANADIAN MACHINERY for some considerable time."

Our reason for quoting this letter is two-fold, first to call readers' attention to the fact that this formula is, as far as the author knows, original. If this contributor can supply some original idea, why not other readers follow suit and send us in their work? Then again it was his first attempt, still his first has been successful. Again we can only repeat, "Try your luck." We should like to hear from readers as to their opinion of the formula to follow.

FORMULA FOR GEARS HAVING 20° ANGLE PRESSURE

This is for a stub tooth gear. A gear having 16 teeth 4-5 pitch (written thus according to Fellows gear system). Proceed as follows: Lay off the pitch

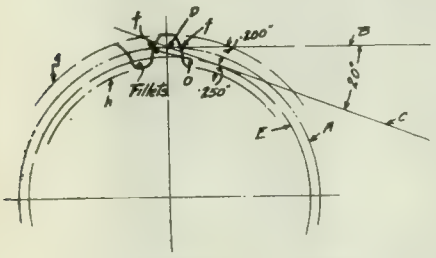


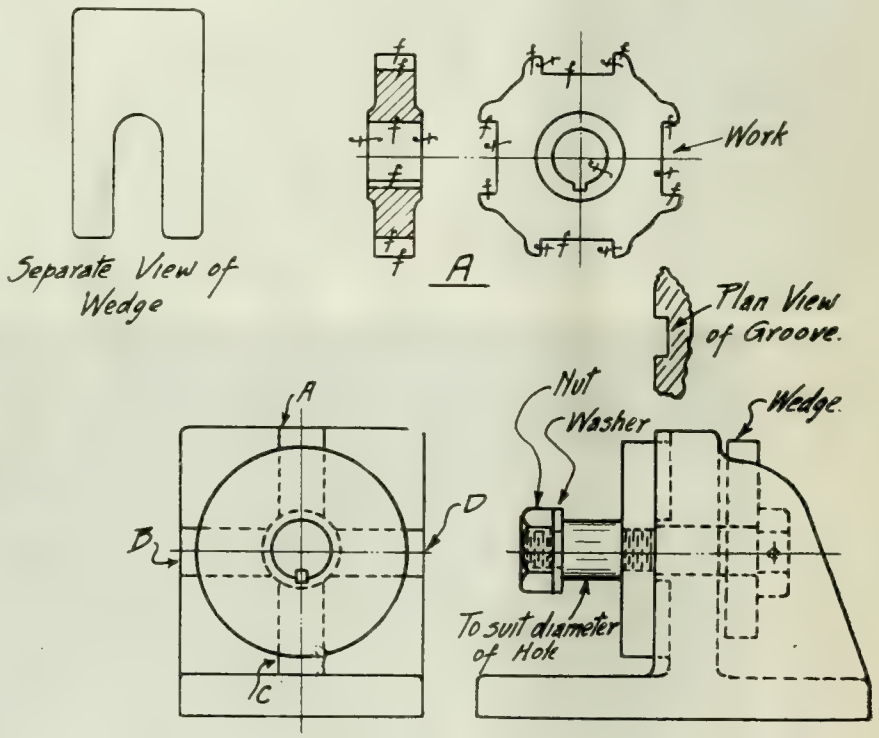
CHART SHOWING THE IDEA.

circle A having a diameter of 4 in. Draw a horizontal line B tangent to pitch circle. Make an angle of 20° from the horizontal line and draw a line C intersecting the vertical centre line and pitch circle at D; scribe a circle tangent to the line C which is called the base circle E; now lay off the width of the tooth on the pitch circle ff, also draw the addendum g, .200 in. above pitch circle and the root .250 in. below pitch circle. Now proceed to draw the teeth profiles, taking ¼ in. of the radius of the pitch circle and placing the needle of the compass upon the base circle at O. For fillets at root of teeth take 1-7 of the opening on the addendum. This can be used to advantage and is very near to being accurate.

FOUR-STOP SHAPER JIG

By J. H. Moore

A shaper jig very much out of the ordinary run is shown in the accompanying illustration. The style of work done on this jig is shown clearly at A, while the general assembly is clearly seen in the other two views given.



GENERAL VIEW OF THE JIG.

Briefly, the procedure is as follows:

The main spindle of the jig is of course made the same diameter as the hole through the work. The piece is now placed on the same and tightened up by means of the nut and washer shown. The first portion of work is now shaped to size, after which the wedge is withdrawn and the work revolved 90 degrees. The slots A, B, C and D provide the stopping points. This procedure is carried out until the work is completed.

A jig of this nature is easily adaptable to many other styles of work, and the reduction in production cost is indeed a big feature with a fixture such as described.

WRINKLES FOR FILE USERS

By M. E.

Here are a few practical wrinkles for file users. A new file should always be used with a light pressure on the work until the needle-like points of the teeth are worn away. After this a greater pressure may be used with much less danger of breaking off the teeth at their base. It often happens in the case of new files that half their wearing property is diminished by a few careless strokes when first applied to the work. A new file should not be used on the chilled and gritty skin of castings, or on a weld where borax or any vitreous flux has been employed. A worn file should first be used on the rough, gritty or oxidized surface, and thus pave the way for more efficient work with a new, sharp file. Again, in filing steel, better results can be generally obtained by using files of a grade not coarser than "second cut," finer grades being employed according to the finish or delicacy of the work under manipulation. Lastly, there is the reminder that the best results cannot be expected from a file if used on brass when it has been supplied for use on iron or steel.

PHOTOGRAPHY AS AN AID TO JOB SHOP WORK

By DONALD A. HAMPSON

In the good old days, the bewhisker machinist with a trail of tobacco juice meandering from each corner of his mouth would have laughed at the suggestion that photography in any form would be a help to him in his work. But "times have changed." And the camera is a worthy helper—in the job shop, too. The two photos accompanying are offered in evidence of that statement.

One shows how a "pin" for a well driller was threaded. Well tool work is extremely interesting; the parts themselves are made in specialty shops either in oil sections or mid continent manufacturing regions and so few machinists have seen much of the work. Repairs are often sent to the factory instead of getting the work done locally, because very few small shops have threading and forging facilities for such work. But the way one shop set up to do a hurry job of turning and threading the taper end of a pin is shown. It was entirely an arrangement of parts gathered up—and it did the work very nicely. Strange to relate, the same job came up a while later and here the photo helped—the man who had set up and done the job had departed, but the new man had no trouble in repeating, with the aid of the photo, which tells the story so clearly.

Then there was the case of the cone which had to be re-bored. Here again, the same kind of a job came up a year later and a new man was put on the work—aided by the photo. The wood block steady rest, the big end in the chuck, parts held on by C-clamps—all these details are shown with the most truthful clearness.

As a preventive to careless work and a saving of foremen's time, the photo is hard to beat. Every once in a while they come in wonderfully useful in some legal matter—the story a photo tells is accepted without taking of oaths. And the equipment need not be expensive either.

Incidentally, the second photo shows the wood steady rest—a valuable helper on job work. The cylinder shown is 25 in. in diameter at the large end and had to be supported in a rest when reversed for boring that end. But who ever heard of a 25 in. capacity rest on a 28 in. lathe? The photo shows that the top piece of wood at the small end is bandsawed out to two curves; one of them is that of the large end and in it the cylinder rests when reversed.



ILLUSTRATIONS PROVING THAT IT PAYS TO TAKE A PHOTOGRAPH OF YOUR MACHINE SET UP.

GETTING OIL IN ENGLAND

By L. P.

The Government has decided to explore Great Britain for oil. There is no reason why our battleships should not be steaming on oil fuel got from beneath our own soil, nor is there any reason why some of our motor cars should not be driven by petrol from under the roads they run upon.

In the past we have been too careless of the wealth that lies under our feet, petrol, lamp oil, fuel oil from overseas were sold here so cheaply that no one was prepared to risk money in drilling for oil in England. But the war has changed the entire position, and petroleum has become so precious that if it exists under England, it must be searched for and got.

That it does so exist has been proved on many occasions during the last century or two. At Clowne, near Chesterfield, there was a flow of 700 to 1,000 gallons daily. Dr. James Young, the founder of the Scottish shale industry, manufactured products 70 years ago from a flow of oil at Alfreton, Derbyshire. A flow at Coalport, mentioned in 1836 by Dr. Prestwich, is stated to have formerly yielded 1,000 gallons a week.

But the most important discovery of recent years was made at Kelham, near Newark in August, 1911. A bore hole was put down there and obtained true petroleum at a depth of about 2,440 feet. The oil sand or rock that gave the oil, was about 13 feet thick, and the bore holes passed right through it. From this bore hole, five to eight gallons of oil flowed to the surface for many months, and was described by our principal authority, Sir Boverton Redwood, as a true petroleum.

Any qualified person who has examined a sample of the oil will agree with him. Provided enough of this oil could be obtained there is no reason why it should not be piped straight away to say, Hull, where a warship could take it on board as oil fuel, just in the state it came from the well.

But there is one remarkable thing about the Kelham oil. Nearly all crude petroleum in its virgin state contains petrol. The Kelham oil contains none. It is incomplete. There is reason to believe it did once contain petrol, if so where has that petrol gone?

The answer is the petrol has become separated from the heavier part of the oil. Where shall we find the complete natural oil with its petrol intact, as contrasted with the Kelham oil? Obviously not above the Kelham oil or the bore holes would have passed through it. Therefort it is said we ought to find it below the Kelham oil—possibly a thousand feet lower. This is a surmise and cannot be said to be a certainty.

Some of us have for years past been urging the Government to drill for oil. We have not predicted with absolute certainty that they will get oil here or get it there. What we have said is that it is worth while making the experiment and finding out whether in these critical times we can depend upon a supply of petrol or lubricating oils, and of liquid fuel, without bringing these from overseas.

The Government has wisely determined to search for oil in England. They have a good chance of being successful.

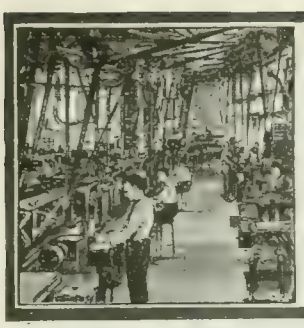
MAKING BLUEPRINTS FROM PRINTED PAGES

By HARRY O. GARLAND

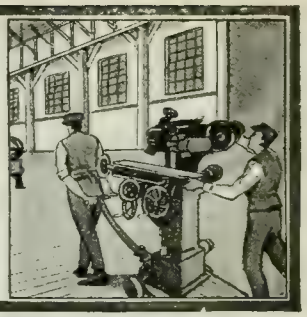
(Copyright. All Rights Reserved.)

Paper sheets that are printed on one side only can be used for making blueprints, just as are tracings, if they are first given a coat of typewriter oil. By wiping the oil on them with a cloth, the paper is rendered transparent by the oil. If the printed sheet that it is desired to reproduce is printed on both sides, it will probably be necessary to erase the printing on one side to get a clear copy of that on the other.

Another method of blueprinting from printed paper sheets is to soak the sheet in gasoline, which renders it temporarily transparent, so that it can be used for making a blueprint just as can a tracing. Ultimately, however, the gasoline will evaporate, leaving the sheet just as it was before the soaking process.



DEVELOPMENTS IN SHOP EQUIPMENT



RELIEVING MACHINE FOR HOBS AND CUTTERS

The machine illustrated in Figs. 1 and 2 is built by the T. C. M. Manufacturing Co. of Harrison, N. J., for the relieving of hobs of any design as well as formed cutters. The machine is also capable of performing many operations usually performed on the ordinary lathe, but its higher cost in some measure make this inadvisable.

This machine is especially suitable for relieving the particular form of hob which has been found most suitable for the cutting of heavy worm-gears com-

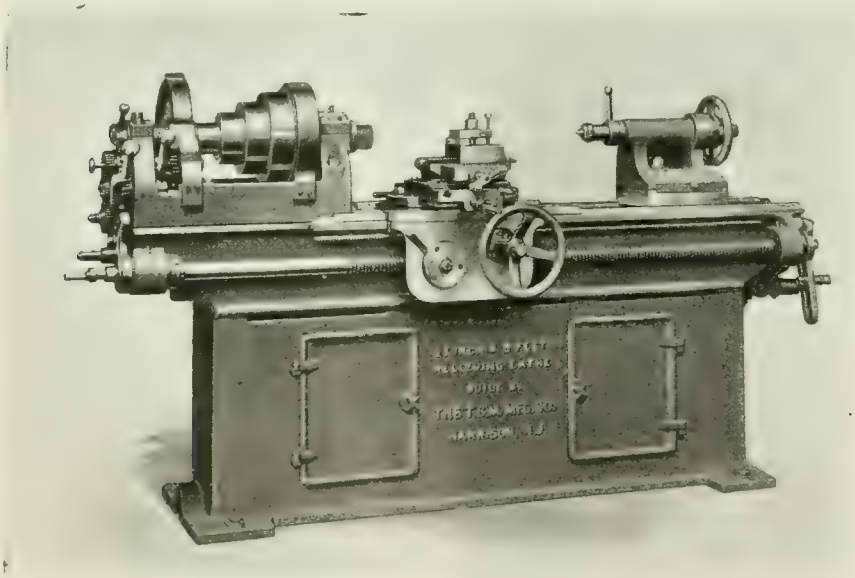


FIG. 1—MACHINE FOR RELIEVING HOBS, ETC.

plete at one pass of the hob. Such a hob is tapered at one end and the threads on this tapered section have a gradually increasing lead, although the lead of the threads on the cylindrical section of the hob are of uniform lead.

Evidently the problem of relieving the teeth of a hob of this special form is considerably complicated by the tapered section on which there is a thread of variable lead; the problem is further complicated by the fact that the gashes in the hob are cut at an unusually steep angle. The relieving operation is divided into three steps, the first of which is to start at the small end of the tapered section and relieve one side of the teeth on the taper; next, gears are changed and the relieving operation is continued by relieving the other side of the teeth on the taper; and at this point the swivel base on which the relieving attachment is carried must be set around to provide for working along the straight or cylindrical portion of the hob. The reason for changing gears when relieving opposite sides of the teeth on the taper is that, owing to the increasing lead of the thread on this portion of the hob, a start must be made with change-gears which are suitable for a number of threads per inch which is less than the number the work actually has. After relieving one side of the teeth on the taper the gears are changed to give a setting corresponding to a number of threads per inch which is greater than the actual number per inch. The result is that the relieving operation is started with an arrangement of gearing which retards the movement of the tool to compensate for the gradual thickening of the thread, due to its increased lead, while the remainder of the relieving on the tapered portion of the hob is performed with gearing which provides for doing the work with an accelerated movement of the tool that also takes care of the thickening of the thread.

Reference has also been made to the necessity of providing for the effect of the steep angle of the gashes, and this is done by employing an arrangement of differential gearing to govern the timing of successive strokes of the relieving attachment. When relieving the teeth of ordinary hobs and similar work with gashes parallel to the axis, it is merely necessary to time the strokes of the attachment so that the tool comes into engagement with successive teeth. But with a hob having spiral gashes with the spiral cut at a steep angle, it will be apparent that the uniform timing for the relieving attachment could not be employed. It is necessary to so regulate the rotation of the work and the oscillating movement of the relieving attachment that the necessary correction will be made for the effect of the angular gashes.

This machine is similar to a standard engine lathe, the work being carried between centres and the relieving attachment supported on a carriage of somewhat the usual design. It is obvious, however, that this machine is provided with a number of interesting features of design which will make it of rather exceptional interest to machine-tool designers. Probably there is no better means of explaining the method of operation than to present a description of the way in which power is transmitted through the various mechanisms from the cone pulley on the headstock. When the machine is used for relieving hobs it is almost universally the practice to drive the spindle through the back-gears, but, owing to the coarse lead of the hob threads it is required to have a considerable difference in the speed of rotation between the lead-screw and the spindle. This result could be obtained through an ordinary train of gears, but in order to simplify the design it was decided to provide two gears, one secured to the spindle and the other to the cone pulley with a clutch between the two, so that either the spindle gear or the cone gear could be employed for driving. The clutch is controlled by a push-rod at the end of which there is a small knob which will be seen opposite the upper gear at the left-hand end of the machine in Fig. 1. The initial speed depends upon whether the spindle gear or cone pulley gear is engaged by the clutch, but, regardless of this selection power is transmitted to gears carried by a horizontal shaft located under the headstock and thence through change-gears at the left-hand end of the machine to the lead-screw. The change-gears may be adjusted in the usual way to provide for relieving the teeth of hobs of any given number of threads per inch.

Located at the right-hand end of the lead-screw it will be seen that there is a train of gears A, Fig. 2, which trans-

mit motion from the screw through a pair of bevel gears B and C to a worm-shaft D that drives a worm-wheel. This wheel is the outer member of a differential which regulates the timing of the relieving attachment to compensate for the spiral angle of the gashes in the manner to which reference has already been made. Power is transmitted to the other side of the differential gear through a train of spur gears, located at the left-hand end of the machine, which drive shaft E. At the right-hand end of this shaft there will be seen three bevel gears, F. G, and H, the last of which is inside the differential. Bevel gear H is carried at the left-hand end of shaft I, which is in line with shaft E. From shaft I, power is transmitted through spur gears to a horizontal shaft, J, carried by bearings inside the bed of the machine, and through this shaft the drive is through bevel gears K and L to a vertical shaft, M, on the upper end of which there is a cam, N, that fits into a cam box in the cross-slide on which the relieving tool is carried. By adjusting the change-gears on shafts I and J, the required number of strokes may be obtained for the relieving tool, while adjustment to compensate for the spiral angle of the gashes is effected by the differential movement.

In Fig. 1 it will be seen that there is a small crank handle midway between the crank on the cross-slide and the hand-wheel on the apron. The purpose of this crank is to provide for releasing the compression of two springs which hold the cross-slide in contact with the cam N that provides the oscillating movement to the relieving attachment. By simply operating this master control lever, the oscillating movement is stopped while the carriage is being run back to the starting point, or while other similar adjustments of the machine are being made. Independent adjustment of the tension of each of these springs is furnished by means of two screws which will be seen at each side of the master control lever. Another valuable feature of the design is the provision of means for locking the differential movement, in order to adapt the machine for relieving hobs with straight gashes or for relieving milling cutters and other similar work. In this connection attention is called to the fact that the relieving attachment is supported on a swivel saddle so that the tool may be set at any required angle with the work. This adjustment covers a range of 180 degrees, thus enabling the machine to be employed for any work coming within the extremes of relieving straight gashed hobs or milling cutters up to the relieving of the side teeth on face mills.

Specifications for T.M.C. Relieving Machine

Swing over bed, 21 in., over carriage. 14 in. Maximum distance centre to centre, 39 in. Hole through spindle, 1 1-8 in. Back gear ratio, 16 to 1.

Range of threads which can be cut, 1-32 in. to 49 in. lead.

Change speed gears provided, or leads 36 gears, for flutes 10, for spirals 18 gears.

Gears driving relieving cam all hardened nickel steel.

Set of six hardened and ground tool steel relieving cams, giving relief from .040 in. to .280.

All spindles of alloy steel heat treated.

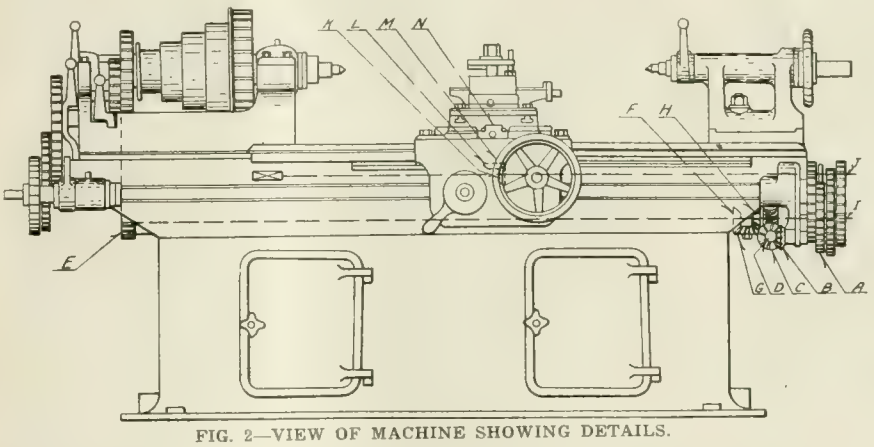


FIG. 2—VIEW OF MACHINE SHOWING DETAILS.

Lead screw of high carbon heat treated steel ½ in. pitch, correct to .001 in. in any foot of length.

Machine fitted with one work arbor, chuck plate and centres. Attachment for relieving spirally fluted thread milling cutters can be supplied if desired at a small extra cost.

Weight of machine 5,000 lbs. approximate. Overall dimensions; length 118 in., width 32 in., height 55 in.

Shipping weight, boxed for export, 5,350 lbs. Shipping space, boxed for export, 124 in. x 38 in. x 62 in.

FOR HEATING RIVETS

The Canadian Blower & Forge Co., Kitchener, are sending out particulars of a "Buffalo" oil burning rivet forge.

This forge consists essentially of a welded steel oil tank, on which is mounted a head or fire chamber.

Air is supplied by means of a single connection which furnishes pressure for the oil supply as well as air for the atomizer. The tank is tested under an air pressure of 100 lbs.

The fire chamber consists of a steel plate housing with cast iron top and bottom plates, held together by means of three screw bolts.

The lining is a 2-inch specially-moulde dfire brick, of the best quality of refractory metal obtainable. The bottom is strengthened by increasing thickness to 2 1-2 inches.

Temperature is under perfect control, and it is impossible to burn rivets even when left in the forge for long periods at a time. This insures clean, uniform rivets, free from the objectionable coating of oxide, or from dirt or ashes.

Report on test made on 12 inch diam. oil rivet forge:

12 3-4 x2 1-2 rivets, 7 minutes.
12 5-8x2 rivets, 4 1-2 minutes.
12 1-2x2 rivets, 3 minutes.
12 1-2x1 rivets, 2 1-2 minutes.

These rivets were heated to a driving heat in the time noted above. Oil consumed 1 3-4 pints.

As the same size burner is used in the 8 inch forge, the above test will apply to that forge also.

Below is a tabulation of the total number of rivets possible to heat at one time:

12 inch forge: 24 rivets, 3-4x2 1-2; 30 rivets, 5-8x2; 35 rivets, 1-2x2; 50 rivets, 1-2x1.

8 inch forge: 16 rivets, 3-4x2 1-2; 20 rivets, 5-8x2; 24 rivets, 1-2x2; 35 rivets, 1-2x1.

ELECTRIC SUPER-SUBMARINES

Designs for a new type of super-submarine have been elaborated by Captain Norman Wood, R.A.F., who recently read two papers on the subject before the Institute of Marine Engineers in London. Previous to his connection with the Royal Air Force, Captain Wood was engaged on submarine work and had practical experience of the deficiencies which exist in the design of even the latest vessels. On the surface, submarines are driven by Diesel oil engines; under water they are driven by electricity from storage batteries which must be charged when the vessel is on the surface. These conditions are usually met by arranging the following chain: (1) Diesel engine; (2) clutch; (3) electric motor; (4) clutch; (5) propeller shaft. It is not difficult to see that this equipment involves a complex series of operations at critical times as, for instance, when the vessel is caught by enemy searchlight when the batteries are being charged. Captain Wood proposes to simplify the transition from engine drive to motor drive (or vice versa), by adopting an all-electric drive, using, in a 1,200-ton boat, two oil engines to drive electric generators supplying current to electric motors fixed on propeller shafts. He anticipates a big development of submersible ships, both naval and mercantile, on the ground that the growth of air power will render submersion the only means of escape from aerial attack. From this standpoint sea power will include air power and submarine power as well as strength in ships of the old type.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-President
H. V. TYRRELL, General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly journal devoted to the machinery and manufacturing interests.
B. G. NEWTON, Manager. A. R. KENNEDY, Managing Editor.
Associate Editors:
W. F. SUTHERLAND T. H. FENNER J. H. RODGERS (Montreal)
J. H. MOORE

Office of Publication, 143-153 University Avenue, Toronto, Ontario.

Vol. XXI. JUNE 5, 1919 No. 22

The Value of a Dollar

THE vice-president of one of the big trust companies in New York is authority for the statement that the solution of the problem of high prices seems to lie in multiplying production rather than in attempting to curtail consumption and to lower wages.

Fred Gardner, a boiler maker of Fort William, speaking to the Industrial Relations Commission, said, "We don't want more wages, for as soon as wages go up, up goes the price of our grub pile."

The chances are that this Fort William man is getting dangerously close to the real situation.

A dollar in our money has as changeable a value as the currency of Mexico. The trouble is that we do not believe it.

If we could take our dollar bill to-day and across the face of it stamp "52 cents" we might realize the situation more accurately.

All through the war we heard that prices would become normal when the necessity of supporting an army abroad was removed. People were led to expect a certain amount of relief.

It has not come, and there are few prospects of it coming.

Rents stay up, fuel is higher, clothing, boots, etc., are on peak levels, while food shows an actual increase.

The Dominion Government has appointed a commission of inquiry to find out why costs are high. This commission is composed of members of the Dominion House, and sooner or later they will want the votes of the people. Little has ever been accomplished in this country by the appointment of a commission. It is one thing to appoint a commission, and quite another to get action from any of its findings.

People do not mind spending their money if they are securing something worth while. But they do want to get back to the point where they can spend their money and get something more tangible than 52 cents' worth of goods and 48 cents in hand-outs to a long line of handlers who have managed to crowd in between producer and consumer.

Speculating or Gambling?

SOME people do not seem to grasp the real meaning of the difference between speculation and gambling.

When a person sits in at a game of cards, takes his chance at getting good or bad, puts his money up and wins or loses, that is gambling. When he takes a set of dice and rolls them around in an effort to turn up spots, that is gambling.

When a chap goes into a brokerage concern, puts his money on Hole in the Ground Mine Co., sits there and watches the ticker tape to see if his gamble—beg pardon, speculation is going to go up and make him, or go down and break him—well that's speculation.

Don't you see where the difference comes in? It is very clear. One is gambling and the other is speculation. A gambler is a sinner in the eyes of the law—the speculator is a citizen in good standing. So if you must do some fool thing, why not speculate instead of gamble?

The Future of the File

A WELL-KNOWN Canadian firm, making files, has sent out word with its shipment that a file is a fine tool, and as such should be protected from rough usage. The notice even goes on to claim that better results can be secured from a well-preserved file.

As a matter of fact, this manufacturer is right, but we hate to believe him. The general acceptance is that a file is a utility tool, and that it can stand hard usage. Therefore, it is the duty of the man who gets a file to give it hard usage.

Ever use a file as a hammer? Not as a sledge, perhaps, but just as something handy at the time.

Ever pry the lids off cans with a file? Sure. Great thing for all such odd jobs.

Ever use the tang end of a file to dig a hole in a brick? Handy for this sort of work.

Ever turn over a heap of tools to find the file you want away at the bottom, where everything else in the box has had a chance to have a kick at it? Own up now, you have.

Most people have had about as much regard for a file as they have for a crow bar. Its cutting edge is regarded about the same as the family razor that shoots father's whiskers, pares mother's corns and when no person's looking sharpens the youngsters' lead pencils. The file is sort of a family instrument. Every house has one in the kitchen table drawer—that is every well-regulated household. And there are more hanged things done with and to that family file than ever happened in a bang-up three-ring circus. It pulls corks out of a bottle, it hammers tacks, it sits around on call when the carpet is being laid on the back stairs, and it comes into active service when the old man is wondering why under the sun the elbow from the kitchen range will not slide into the stove pipe hole like a reamed out cylinder and piston. It is the family file that crawls in beside that stubborn pipe and stays there too while the old man administers the final heave that puts the smoke stack in action.

Well, to be sure there may be better times on ahead for the file. It surely has had a whale of a time in its day, and when the day is over it generally gets its whiskers shaved off and does service as a screw driver, a chisel, a scraper, a centre punch, a drift or what not.

This process of education may do much. Certain if it does anything at all it must be for the better. It may even be that in years to come the file will get decent treatment in the shop and occupy, in the home, the place on the piano that is now given over to a picture of John Henry, taken in the suit he wore when sticking the point of a bayonet into the breeches of one Fritz.

Metric Be Tinkered

I'VE read an awful heap of stuff 'bout metric system laws, and words of queer and curious sounds they agitate my jaws. They speak of kilograms and stuff, of centimetres, too, until the atmosphere burns out and everything looks blue.

They say we have been taught all wrong on how to measure junk, and that the system what we use is plain unvarnished bunk.

When I was young, 'twas long ago, we hastened off to school, and there into our mind was burned the 12-inch measurin' rule. And when we wished to speak of things about their width or height, the usin' of the inch and foot seemed altogether right.

We juggled then, by heck, we did, with yards and rods and chains, these things did much in days gone by to rear our childish brains.

A dollar is a hundred cents, there ain't no doubt of that, and folks what argue otherwise is whisperin' through their hat.

And yet they come and tell us now that all these things be wrong, that we should dance and tune our harp unto the metric song—that we should take our yards and feet, likewise our inches, too, and toss them all into the can and grab off something new.

I do not love these changing times, with all their notions strange, they camp beyond my mental grasp and dwell beyond my range. They make it powerful hard for folks what's built like me and you, to keep our balance through the day and know just what to do.

Why can't them meddlers take some task that really is worth while, some job that measures not a foot, but stretches out a mile. I'd like to rise up from my seat and ask that metric group, to tackle now the price of bread, of beefsteak and of soup. Yes, let them work and show to me how pork and beans and hash can come again and rest within the limits of my cash, and let 'em reckon out at once about the cuts of pie, what's slivered now to sink within the corner of your eye. These things, my friends, are worthy tasks, to me that is a cinch, more worthy far than tryin' to chase our yard and foot and inch!—ARK.

WHAT'S become of the shop joker who used to be sending the apprentice out to look for a left-hand monkey wrench and a flat-faced hammer?

* * *

THE garrison in Montreal could not fire a salute on the King's birthday because they had no ammunition. However, as long as the Ottawa House stays in session the country shall not lack for explosions or the fear of them.

* * *

THERE are some folks who really have something to say, while again, there are quite a heap who simply have to say something.

* * *

A PENNSYLVANIA peanut and fruit stand man left an estate of $30,000. The man who stows away a nickel's worth of peanuts in his vest pocket will be willing to believe this.

* * *

ON A Detroit street a doctor, undertaker and tombstone maker have their establishments side by side. As the efficiency man in the machine shop would say, the sequence of operations is admirably arranged.

* * *

A TRACTOR was being demonstrated at Richmond, Mich., when it became unmanageable and ran through a drug store. Being of the caterpillar type, there was doubtless something in the drug store to meet its case.

* * *

PINCH-BACK coats are going out of style, and the high price of ham and eggs keep on attending to the pinch in front.

Repeated Expressions of Successful Men

By DONALD A. HAMPSON

"I DON'T WANT A MAN IN MY SHOP WHO KNOWS ANYTHING." A manufacturer of hack saws who was making his factory independent of skilled workmen by the use of full automatic machinery—and he did it, too.

"MY FRIEND, THERE IS NO SUCH THING AS LUCK IN THE HARDENING GAME." A superintendent of punch and die departments to a workman who cracked an expensive drop forging die because he hadn't properly preheated it.

"WHAT'S THE USE OF PAYING SHANNON? HE'LL ONLY PUT THE MONEY IN THE BANK!" A factory owner of the sport variety who depended on a faithful executive to keep the business going. Shannon finally quit to get a year's back pay, something which had a sobering effect on Mr. Sport.

"IT'S NOT THE MACHINES YOU HAVE, IT'S THE MEN." So said a superintendent of a shop in New York City making the only steam specialty of its kind that would meet U.S. Navy requirements. This was before the war and there had hardly been a new machine in the plant in ten years, but they had good tools and appliances AND the men had been a lifetime on the job, hustled, took a personal interest in the shop, and earned big money. The product was good all the way through and it was an honor to be a member of the staff.

"WHEN YOU'RE RUNNING THIS DEPARTMENT, YOU CAN DO IT THAT WAY—UNTIL THEN MY WAY GOES." A department head who encouraged suggestions but, as he was responsible for the work, wanted to authorize any changes before having them carried out.

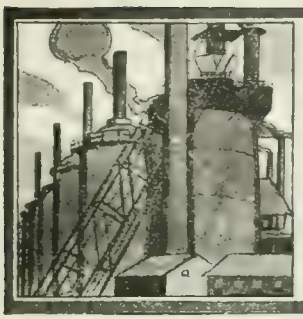
"THE MAN WHO NEVER CHANGED HIS MIND NEVER DID ANYTHING." An executive who did the unexpected, even to reversing his decision. But his schemes, though radical, were good, the best proof of that being that after his death, his designs were left unchanged in the face of all the latest improvements offered in competition.

THE Dominion Government is likely to give assistance to the municipalities that want to go into the cold storage business. What's the trouble? Is the Government afraid to lay hands on the cold storage plants already in existence? Or is it just another way of shoving the thing along to the municipalities because Ottawa lacks backbone to settle it?

Submarine Indemnities

AT an international conference of transport workers held in Amsterdam recently the Belgian delegate introduced the following motion:

The International Conference of Transport Workers, taking into consideration that approximately twenty-two thousand seamen of all nationalities have been murdered in consequence of submarine warfare, appeals to the German Government to grant full indemnity to the families of these murdered seamen. The report says that the German delegates expressed approval of this motion.



MARKET DEVELOPMENTS



A More Hopeful View Taken of the Market

Indications Are That Business is on Eve of Development as Soon as Labor Troubles Are Settled—Buying for May Made the Records for That Month Very Satisfactory

AN increasing number of firms can be found which state frankly that they consider business as being on a good footing, and in good shape to take advantage of the expansion which they feel certain is coming very quickly. This does not refer to dealers in Canadian centres alone, but to American concerns in the steel and iron trade. One of the largest of these mills has a circular letter out, which is mailed to many in the Canadian trade. It speaks unreservedly of favorable developments which have already set in in the steel market, among which increased buying is the best.

Warehouses handling steel and iron products report that May was a particularly good month. There were many sales and they were good ones, and in many cases they indicated a belief in the future and an acceptance of present market values as being fair and liable to hold for some time to come.

The machinery trade is finding that it is harder to get immediate delivery on purchases made now. Many of the makers of machine tools are actually behind on deliveries, and this indicates large buying and bookings.

Dealers in supplies state that list prices still hold, but it is not necessary to go very far to find that there is a great deal of elasticity in the market. For instance, there are certain lines which some dealers are selling at 45 per cent. on the list, while others are selling at ten and five off. There is considerable competition now, and "Get the business" is once more finding its way into the rules of the market.

Scrap prices for the first time in some weeks have taken a turn for the better, especially in coppers. Red brass is also more in demand, due, it is said, to large buyings of the American roads for car bearings. But the scrap metal market can stand a lot of improvement yet before it is in a healthy state. Indications are that the trend for higher copper is going to continue.

MONTREAL BELIEVES THAT THERE WILL BE BETTER TRADING SOON

Special to CANADIAN MACHINERY.

MONTREAL, Que., June 5.—Everything points to a betterment of the industrial conditions in the near future, and this feeling appears to be prevalent throughout all trade circles. Activity generally shows little increase, but the impression seems to be that the inquiries that are coming in will shortly be followed by substantial business, and of a character that will create greater confidence in those that have been holding off reconstruction enterprises, due to the unsettled state of conditions generally. The strike situation is still a factor to influence business, but their appears to be a more hopeful tone as to the ultimate settlement of some of the difficulties that are now confronted by the different parties.

Steel activity continues steady, but the dealers here anticipate a better business within the next few weeks. The general metal situation is unchanged and the improvement of the past few weeks has fallen off a little, but the volume passing is still sufficient to maintain the interest of the trade, and the hope is expressed that steady business of increasing volume will be a feature of activities in the near future.

The machine tool business is again occupying an important position in the general activities of the markets and the increasing demand does not appear to be of a transient character, as reports from dealers appear to emphasize the growing demand that is coming in for all classes of equipment. In many instances users of tools are beginning to find that delivery is becoming more uncertain and that some lines are hard to get under several months. Prices on many new lines have shown no material drop for some time, and the supposition is that declines will be less in evidence from now on. Scrap is again quiet after a week of slightly increased activity.

Better Feeling Slowly Developing

Apart from the fact that the steel market has become an open one, entirely free from the restrictions that were imposed during the war, the conditions that exist to-day are virtually the same as those prevailing during the last weeks under Government supervision. Little improvement has developed in the operation of the mills, and in many instances these are closed down or working at low capacity. Despite this condition, however, there is the feeling that the trade generally is beginning to realize the impractibility of much lower prices on many of the regular lines of steel commodities. This is having the effect of renewing the confidence of the consumer to the extent that inquiries are coming in for advanced delivery, not in great volume, but sufficient to indicate that the early future may see a partial return to the old activity. The quiet months, however, are now approaching and any material increase in the regu'ar demand will probably not be fully felt until the fall period. One of the factors that has prevented the actual condition of the market becoming known is that, so far, no really large order has been placed for domestic requirements, and until this does happen, operations on a competitive basis cannot be expected. When worth-while business does loom up it will show just what can be done in the way of other than paper readjustments of steel prices.

The local trading has been comparatively good, but not exceedingly heavy. Plate sales have been about normal and

a slight increase in boiler tubes is announced, but on the whole the business reported remains about the same. Dealers here have reduced the quotations on their plates, the decline being about ½ cent per lb. Plates, ½ and up, are now $4.50, and the smaller sizes $4.90 per hundred. Checkered floor plates are now 6½ for the heavy sizes and 6¼ for the smaller sizes.

Scrap Again Develops Weakness

Following the brief activity that was evident in the market a week ago, the situation has again resumed its quiet condition with the movement of old material of a small volume. However, the better feeling that prevails appears to be general throughout the trade, and most dealers are looking forward to a return of more regular and increased business. There is still that atmosphere of doubt that has characterized the situation during the past months, but the contention is still advanced that improved conditions will eventually follow the signing of the peace terms. Whether this is the real reason for the reserved attitude of the average consumer, or that other circumstances combine to make the market one of exceptional dullness, it is difficult to determine, but the fact remains that consumers are not buying any material that they do not require for immediate needs. Dealers are not surprised at the reaction that has taken place during the past week, and some anticipated that the stronger tone would possibly be followed by a decline, and this has happened this week and the prices quoted indicated the weaker tone of the market. Heavy copper and wire are down ½ cent, the quotations being 13½ cents per lb. Compositions have declined a similar amount and the price quoted is 12½ cents per lb. Yellow brass turnings at 6¼c show a decline of ¾ cent per lb. Nearly all the steel scraps have declined; wrought iron axles, rails, malleable scrap, wrought pipe, and cast borings are all down $3.00 per ton. Machine cast iron, car wheel, and steel axles, show a decline of $2.00 per ton. Boiler plate has been reduced from $11 to $10, the latter being the current quotation.

IMPROVEMENT NOTED IN TRADE CONDITIONS

Feeling Grows That Business Will Boom When Labor Troubles are Adjusted

IT is not necessary that a person should be much of an optimist in order to see that conditions in the markets are improving. Dealers who have for the past six months been more or less doubtful are now coming to the point where they are willing to admit that they have come through the time since the signing of the armistice in good shape and are now on the verge of more and bigger business than they have touched since the war programme was at its height.

This feeling is not confined to any particular line. It is general, and in spite of all the strike and labor troubles it persists in making itself felt in many places.

General Buying Now

Machinery dealers have figured on a lot of business, much of it of a general nature. It should be placed shortly. A lot of business is coming into the market for the wood-working dealers, and sales of good, new equipment for these shops is frequent and liberal. The making of adjustments on account of war contracts does not finish up quickly. Several of these claims have been adjusted but many more are still "in the process," and apparently there are no short cuts to the finished deal. When this business is finally disposed of several firms will be able to go ahead much better than at present, and they will also be able to clean out their old war plants.

From reports that one hears around the machine and supply houses there must be a fairly liberal spread on some of the prices that are being quoted for supplies and small tools. For instance, it has come out that in some cases certain cutters are being sold at 45 on the list, while other dealers are selling them at ten off, while at least one place geos one better and makes the discount ten and five off. The lists look the same when they are handed out or spoken of, but when one has an order in his pocket large enough to look interesting it does not take very long to find out that there is quite a good deal of elasticity in the quotations.

Scrap Market is Stronger

For the first time in many weeks dealers in the scrap metal trade report that there is a change in their business, and that change is for the better. As mentioned in these columns before the trend of copper is upward. This is emphasized now in the way of higher prices for crucible and heavy copper and copper wire, while certain of the brasses are up slightly. Dealers are willing to stay with their prediction that the close of the year is going to see a much stronger market for coppers. It has been some months since dealers were willing to mark up higher figures for anything in the line of scrap, but this week more than half a dozen alterations were made all in the same direction.

No special reason can be assigned for the improvement in brass and copper. It is known that the United States has been buying large quantities of red brass for bearing boxes, and this might have the effect of lending some strength to the situation. But copper is undoubtedly going better now and will improve its position.

Yards are not taking in much material from war shops now, although there is considerable of this to be disposed of. The price for this class of stuff is not very tempting at the moment, in fact it is lower than some months ago. It is necessary before using it to separate the iron from steel, and break the former into cupola sizes. Dealers are paying about $11 for this material now, the price being based on f.o.b. the plant where it is being taken from, and the loading is generally looked after by the firm making the sale.

The quotations for wrought pipe are still very low, and the metal is really worth more, but just at the moment there is no market for it.

May Was a Good Month

Dealers in steel and iron in all its various branches have no complaints at all regarding the business they did during the month just closed. There was heavy buying all through.

One of the Toronto firms has received a letter from the La Belle Iron Works at Steubenville, Ohio, and it shows very plainly the confidence that is felt by this concern. It is well worth reproducing.

While we may be wrong, it is our impression that conditions are very much better than they have been, and the start may be made for the good times attending the reconstruction period which everybody thinks we are sooner or later going to have.

We have received a good many jolts since the armistice was signed, but have recovered from all of them, and it is now commencing to look as if in all lines of trade, which includes merchants and manufacturers, that they are impatiently waiting for the moment when it would be advisable to go ahead. One of these days the country will wake up and find that the move has started, if this has

POINTS IN WEEK'S MARKETING NOTES

By reason of increased bookings United States Steel Corporation is increasing its bookings.

—

For the first time in many months dealers are making increases in the scrap metal quotations. They anticipate that copper will be much stronger by the end of the year.

—

Warehouse interests handling iron, steel, tubes, sheets, plate, etc., report that the month of May was a good one for business.

—

One report has it that one firm sells cutters at 45 on the list, while another dealer is handling them out at 10 and 5 off.

—

Several large undertakings are seriously interfered with by reason of the strike, and they may be abandoned entirely.

—

Those who were looking for another cut for steel in June have withdrawn their predictions.

—

Deliveries on machine tools are now running behind in many lines.

—

Montreal warehouses make plate prices the same as Toronto, the ¼ in. being quoted at 4.50.

not already happened, and we are reasonably optimistic for the immediate future, which is an entirely different feeling than we have been able to entertain for several months.

There are many more inquiries for sheets and kindred products. The automobile industry is going ahead at a lively rate, and much more steel will be used for this purpose during the last six months of 1919 than the first six months. We have opportunities, as a matter of fact, to quote on all kinds of tonnage for this purpose.

In our lap-weld department of the tube works we are operating in full, and the best promise that can be made today, of all sizes, 3 in. and larger, would be from six to eight weeks.

The steel industry is in a snarl with the Railroad Administration, who are large buyers, ordinarily, and maybe not much can be expected from this source, regardless of prices, until financial arrangements have been made. A man without any money in his pocket usually makes more noise than the fellow who is able to pay, and I think that the Railroad Administration have been taken a little bit too seriously. As a result of the snarl, it is our impression that steel manufacturers, generally, have made up their minds that present prices were close enough to cost, any way, so what would be the use of cutting?

Just in this connection we can say to you frankly that the majority of consumers of steel products throughout the country do not appreciate the advance in the cost of manufacture between today's rates and those in effect during the early part of 1915, when we were at the low point.

We were interested here in noting a recommendation that was made by Mr. Hines, that prices should be based on a differential between raw material and finished material equivalent to an advance of 50 per cent. over the average differential between these products that had prevailed during fifteen or sixteen years prior to the war. Just to check up, we made a comparison of conversion costs between April, May and June, 1915 and at the present time, with the result that the actual cost of conversion now is from two and a half to three times greater than in 1915. That would mean that instead of the differential being increased by 50 per cent. that it should be increased from 250 to 300 per cent. As a matter of fact, some lines are being sold at cost to-day, and as one of the producers of steel who might compare favorably with the average of low cost concerns, can say to you that there is not much room left for further cutting. This is more than true when operations are at 50 per cent. to 75 per cent. of capacity. The only thing that would have a decided influence on present prices would be reductions in labor and that in our opinion is some distance away.

Yours truly,
LA BELLE IRON WORKS.

"GREATLY IMPROVED" IS THE REPORT ON THE PITTSBURGH STEEL MARKET

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., June 5.—The increased rate of buying of steel products already reported is receiving more attention and on all hands it is being said that the market situation is greatly improved. In new shipping orders, and in specifications or shipping orders against contracts, the Steel Corporation had a tonnage in May equal to about 75 per cent. of its capacity, while its actual shipments were probably in the neighborhood of 60 per cent. This in itself would not mean that the statement of unfilled obligations, to be made public June 10, will show an increase, for that statement includes tonnage merely sold under contract, much of the actual business received in May being in specifications against contracts which stood on books as unfilled obligations at the close of April. By reason of the increased bookings the Steel Corporation is increasing its production along some lines. The independent producers have also been in receipt of considerably more business, but in their case the business is chiefly in the form of new orders, as they had relatively few contract obligations.

Steel mill operations probably averaged about 60 per cent. of capacity at the beginning of May, dropping to about 55 per cent. by the middle of the month. Since then there does not seem to have been any decrease and there may be a slight increase this month.

Summer Usually Dull

No one, except perhaps a few ultra-optimistic among the producers, contend that the improvement recently inaugurated represents the actual beginning of a full-fledged buying movement such as would set the steel industry to operating at capacity and cause prices soon to begin moving upwards. About the most that is claimed is that the continued decline in demand, with its weakening influence upon prices, has ended, and that whatever changes occur in future will be for the better. For there to be a full all-around demand for steel it would be necessary that there be large orders for steel for construction purposes, such orders being but little in evidence, and that there should be a fair volume of railroad buying, while, as a matter of fact, there is practically none. The 200,000 tons of rails bought about ten days ago do not count for much, and there does not seem to be anything else definitely in sight, at least until the railroads are returned to their owners at the end of this year.

July and August are always very dull months in the steel market, unless conditions are altogether exceptional. This improvement in the market, therefore, is going to be submitted to a crucial test in less than four weeks, and its behaviour then will no doubt throw considerable light upon its prospects. To illustrate this point, in the summer of 1915 there was much activity, as the foundation for the great war boom in the steel industry was being laid, while in 1916, when the steel trade was going strong at full speed, there was not only a summer dullness, but the dullness began in June. Correspondingly, the market began picking up in August, not waiting for September.

Price Cutting

Even the steel producers who insist that they are adhering strictly to the price schedule of March 21 in all particulars admit that there is considerable shading of prices by some of their competitors, but this shading is usually only a couple of dollars a ton, four dollars a ton being an altogether extreme case. Such cutting, however, is not altogether unfavorable to market stability in general, because it furnishes a proof, formerly lacking, that there is business to be attracted at approximately the present prices. When the reductions of $5 to $7 a ton were made in March it was thought that if those cuts did not produce a reasonable amount of business, further and still larger cuts would have to be made. Now such extensive reductions are regarded as altogether improbable. Recent predictions that there would be another general reduction in June, following those of December and March, have been withdrawn.

Divergent Conclusions

As formerly, altogether divergent conclusions can be reached from practically the same facts. The facts are substantially that buyers are very conservative, purchasing only what they know they must have early deliveries only, and seeking price guarantees even at that, investment buying not being into the market to any extent, as large construction jobs are conspicuous by their absence, and there is practically no railroad steel being bought. The conditions for a good, strong, broad market are practically all absent. Construction work is usually assumed to absorb half or more than half the steel output when it is at normal rate and it is stated everywhere that ordinarily the railroads take a large part of the steel made, estimates of the railroad proportion of the total steel made in a good year ranging from 20 to 35 per cent. Obviously then the steel situation is very bad. Viewing matters from another angle the conclusion must be diametrically opposite. The steel mills have not averaged less than about a 55 per cent. operation, and earlier in the year when conditions were still more unsettled they ran at much higher rates than that. Orders are being received at more than 55 per cent. If the irreducible minimum of buying is so high then when all the other buyers now absent from the market come in there must be a very heavy demand indeed. Some time there is going to be construction buying as many large projects are on the boards, simply deferred, and there must be heavy railroad buying some time or the

country is going to tread the path of having hardly any railroad facilities at all in a few years.

For "the long pull" at any rate one cannot possibly avoid being very sanguine as to the American steel trade. As to prices, and "price readjustment," the idea six months ago was that there would have to be great reductions, as the war-time steel prices averaged 111 per cent. above the ten-year pre-war average. During the intervening six months the steel situation and prospects have been helped not so much by what has gone on within the trade, though the December and March reductions brought prices to only 81 per cent. above the pre-war average, as by what has occurred or has failed to occur, outside the steel market. Other commodities, in general, have come down but little, and it is now admitted that they are not going to come down to any extent. The inflation is to be more or less permanent. The deflation will proceed slowly, with many stoppages. The latest Dun and Bradstreet index numbers, based on a wide range of commodities, show prices approximately double the pre-war average. When commodities in general are not coming down there is no particular reason why steel should be an exception.

Pig iron remains practically at the March 21 prices. There are some irregularities, but there have been no outright declines of any consequence, and none are expected now, with so many furnaces out of blast.

The Connellsville coke market shows a stiffening tone. Coke operators are thinking of higher prices for second half furnace coke than they would have entertained three weeks ago. The furnaces will hardly agree, and if they do not, the purchases will be made from month to month instead of for the half year.

BIG EXPANSION OF AUTO BUSINESS

Very Large Plant Now Planned on the River Front at Port Huron

Special to CANADIAN MACHINERY.

NEW YORK, June 5.—Although machine-tool orders were somewhat fewer in number during the past week than the week before, the general tone of conditions shows a steady improvement. The lull last week was partly due, no doubt, to the double holiday at the end of the week. As Memorial Day fell on Friday, many manufacturing plants declared a double holiday, shutting down Thursday night until Monday morning.

A satisfactory development in machine-tool trade is the growing demand for tools from general manufacturers, the demand during recent months having been quite largely from companies in the automotive field. One of the large buyers last week was the Standard Oil Co., of New Jersey, which placed orders aggregating about $300,000 for a repair shop at Bayway, N.J. The Federal Shipbuilding Co., Kearny, N.J., continues to buy and the American Shell Co., Paterson, N.J., formerly a war plant, will manufacture centrifugal extractors and electric motors for washing machines, and has received bids on a list of equipment, which will be bought within a week or two.

The automobile industry continues to expand to keep pace with the remarkable demand for passenger cars. The Studebaker Corporation, South Bend, Ind., announces that it will expend $8,500,000 this year for expansion of facilities and a new and large automobile plant is to be built at Port Huron, Mich., by C. L. Wills and John R. Lee, both formerly connected in official capacities with the Ford Motor Co., Detroit. The Port Huron plant will build a 6-cylinder car which Mr. Wills has designed. The site selected at Port Huron has a three-mile frontage on the St. Clair River and a plant will be built for the entire production. Arrangements are being made to bring iron ore from the Lake Superior mines to the plant by boat, and a blast furnace therefore will be a part of the new plant. Mr. Wills was chief engineer of the Ford company, having been with the Ford organization for 18 years. He resigned a few months ago. Mr. Lee was in charge of the social welfore, profit sharing and bonus departments of the Ford Motor Co. A part of the site at Port Huron will be used for the construction of a model workman's village.

The Bethlehem Steel Co. will build a valve manufacturing plant at Redington, Pa., and is in the market for equipment to machine the valves. A foundry will also be built.

BUYING MOVEMENT IS STARTING IN BIG WAY IN PIG IRON MARKET

FROM the various centres of the pig iron trade come encouraging reports. It would seem as though the long-awaited buying movement was actually arriving. Following are the reports by districts:—

Cleveland.—Enquiries for foundry iron in lots of 500 to 1,000 tons are numerous, and at least one enquiry for over 1,000 tons has appeared. A number of sales have been made for last half delivery, and some orders for malleable have also been taken, amounting to about 4,000 tons, for last half. Some furnaces are piling a small portion of their output.

Boston.—A better demand for iron is apparent from industrial consumers, notably textile machine and machine tool makers. While most of the sales are still in small lots, the total makes up a respectable amount. One firm reports sales during the week of approximately 4,000 tons.

New York.—Both enquiries and actual business have shown an improvement during the past week. Numerous sales have been made for third quarter and last half. Although prices have not advanced, the tone is very firm, and with the better demand for future business, it may be said that the lowest levels have been reached. Charcoal iron is quoted at $36.50 for prompt shipment, and $29.25 for last half.

Cincinnati.—There has been a good enquiry from outside melters. Prices are firmer generally. There has been no demand for malleable or basic iron, but high silicon iron is still in request. Opinion inclines towards higher prices for the last half requirements.

St. Louis.—Southern furnaces are quoting No. 2 foundry at $30 per ton, which is a reduction of $2.25. This represents freight absorption to meet northern competition. Enquiries are good, and a fair number of sales in carload lots are reported.

Birmingham.—While most makers are quoting iron for last half delivery at the prices named in the last Washington conference, some furnaces are absorbing the freight rates when in competition with Northern makers. Further curtailment of production will take place next week.

Philadelphia.—While a fair amount of business is reported, the improvement noticed recently was not fully maintained. There is not much demand for future delivery apparent, neither are makers looking very hard for this class of business. Standard low phosphorus is quoted at $40 per ton, with a good supply. Prices on foundry are lower, with quotations showing a wide range.

Pittsburgh.—There is a fair demand for foundry iron in this district. The Standard Mfg. Co. is looking for 2,000 tons for June delivery, and some orders have been booked for third quarter. Actual sales have been mostly in small lots, although one sale of 3,500 tons has been noticed. There have been a few transactions in bessemer grades, and with the improvement in the ingot mold business, expectations for this class are good.

Buffalo.—Numerous enquiries and a better actual business turnover has created rumors of higher prices. Enquiries during the week amount to well over 20,000 tons. The fact that the price of ore is fixed, and coke at its lowest limit, would tend to make higher prices for pig iron necessary. There has been no increase in production.

Chicago.—The indications are that a buying movement for last half requirements cannot be long delayed. There has been some buying in a small way already, and enquiries for lots up to 1,000 tons are frequent. One indication that more iron will soon be required is the increased demand shown lately for foundry coke. With production curtailed and shipments going through freely, the amount of iron piled will not be sufficient to affect the market.

First Soldier (in restaurant): "How's your egg, Bill?"

Second Soldier: "I'll match you to see who goes back for the gas masks."—Jersey Journal.

Up to Canadians to Get After the Business

Lloyd Harris Puts the Case Squarely Up to Canadians—There's Lots of Business to be Had, But It Requires Courage and Resource to Handle the Situation

THAT there was plenty of business to be secured, and that it was good business, was what Lloyd Harris, chairman of the Canadian Mission in London, Eng., told the Toronto Board of Trade on Tuesday. He also made it very plain that it was up to the manufacturers to go out and secure it, and at the same time make certain that they would be able to handle it satisfactorily. His mission had no intention of making of itself a glorified commercial traveller, but they were at all times willing to meet all the representatives of Canadian firms, and tell them where to go and what to do.

"When I arrived in England conditions were awful. The people of Canada know nothing of the enormity of the effort and sacrifice of the British. The people were on rations, and they did not have enough to eat, nor enough fuel to keep warm."

Timber needs were enormous and they would continue so for some years to come. There had been very little work done in the way of construction during the war, and a large quantity of timber is required for road work. For at least three or four years Britain will take all the timber she can get. Mr. Harris had gone to the Timber Control, and had been offered large contracts for this country provided the financing could be arranged. This had been done and very large orders had been placed both in Eastern and Western Canada.

"The matter of import licenses bothered us for some time," stated Mr. Harris. "Through some flaw in the wording of the regulations a joker had actually been inserted to the effect that the country could not allow imports from Canada. It was a case where the father did not want to know his own child. It was difficult at first to convince the authorities that the clause was really there, but now the British markets are open to all Canadian imports, and I doubt if Canadians realize what that really means to them."

Everything that is produced in this country is wanted. The British manufacturing world has not got started yet owing to labor conditions and the trouble in securing raw materials. There is practically nothing that can be produced in the Canadian industrial world that cannot find a market in Britain right now. Many Canadian manufacturers who have been over have found this to be the case and they have returned to this country with large orders for their shops.

The Condition of France

"We had thought France would require a lot of material, and so she does. We travelled all over that country, and I never saw such a state of affairs," continued the speaker. "Railway bridges and tracks were blown up and wrecked by the mile. All this has to be repaired and rebuilt, and France has a big work ahead of her." Against this Mr. Harris pointed out the problem that France had to face in an economic and industrial way. France had a big debt, she had a large army to demobilize, and it all meant that she had a big financial burden. It is a fact that the country for some years to come will have to raise four billion dollars annually to meet her obligations, while before the war the amount needed was equal to one billion. France, to a great extent, must prevent imports, she must use her own men and her own material, and with her we can have no quarrel for pursuing such a policy. Conditions in Belgium are different, and that country will recover quickly, as the country is small and compact. The openings for trade in these two countries are limited at present, and the Canadian Mission, after finding this to be the case, had turned its attention to Rumania, Serbia, Greece, Poland and the Czecho-Slovaks. Poland is being reborn. It is an industrial country and the people want nothing so badly as to go to work. They are not Bolsheviks, and very little is needed to enable them to start. Their great want is clothing and raw materials. The need for clothing is so pronounced that men in the army have only one shirt, and from wearing these garments so long typhus was getting a start in the country and there had been thousands of deaths. The Bolsheviks are on one side and the Germans on the other, and that country needs help and needs it quickly.

The Rumanian Situation

"The principal industries in Rumania are agricultural and the production of petroleum. The Germans," stated Mr. Harris, "destroyed practically all the rolling stock of that country. They got between five and six hundred locomotives in one place and lit the fires under the boilers with no water in them. Oil is burned entirely for fuel. In this way they practically destroyed all the motive power of the Rumanian roads. Not only this, but the Germans took away all the agricultural implements so that this year it is doubtful if the country will be able to feed herself. Rumania needs everything. If we could finance the business we could get enough right there to keep all our factories going. We could sell them locomotives, agricultural implements, and clothing. There is lots of business there, but the question now is that of financing. They have no standing in the matter of credit, and it may be that we will have to go back to the Indian custom of barter in order to open up trade. They have huge quantities of oil which they could send us, and oil is very much in demand at present. In Southern Russia there is a situation that is somewhat similar, and we could get from that country in exchange for our produce, manganese ore, hides, tobacco, iron ore and petroleum.

Up to the Manufacturers

"I don't think the Government should be asked to go into the matter of credits on this sort of business. I can put you in touch with the proper people to deal with. It is up to the manufacturers and the bankers. If the people here are going to make a careful study of the export business they must show a great deal of resourcefulness. Things have been going along so easy here for the past five years that we have not been building up any real selling organizations. The war business came without much effort on our part."

Greece the Big Chance

Greece, according to Mr. Harris, was in a great condition. Her land had not been much damaged by the war and she had a great amount of shipping, on which a lot of money had been made during the war. Her credit is all right and there are times when the exchange rate is in her favor. Premier Venezelos has wonderful ambitions for his country, which has been lying dormant for many years. Greece, with the new territory which will be added, will have a population of between twelve and thirteen million people, and the new land that is being added is agricultural. They do not produce a great deal in Greece outside of currants and nuts, but they have good deposits of certain minerals. Greece is the gateway to the Balkans, and the Greeks are real merchants. "I met Premier Venezelos a good many times," continued Mr. Harris, "and, after finding out the real conditions I suggested to him that they should make Canada the workshop for Greece. He was impressed with the suggestion, so much so that Greece is going to send a purchasing mission here to buy for a syndicate which will represent practically the whole nation. Mr. Venezelos also told me that the Greeks had to be well fed, and as one of their chief articles of diet is bread, we made a bargain whereby Greece will take one million bushels of Canadian wheat a month for twelve months."

Canada must find a market for her agricultural products as well as for her manufactured goods. The people of Britain are not going to buy as much as formerly from Canada because the people there have not the buying power now, so that this country must build up new

Continued on page 80

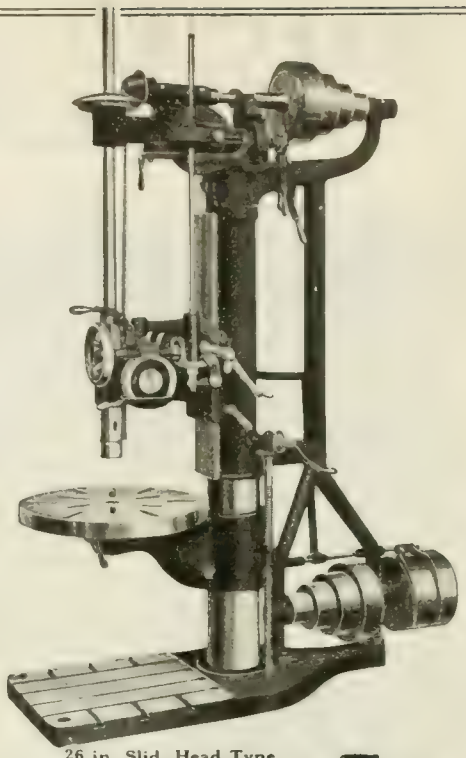
A Complete Line 8 in. to 50 in. Swing
with or without tapping attachment.

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy — Strength
Convenience of operation

CARRIED IN STOCK BY


26 in. Slid. Head Type

The A. R. WILLIAMS MACHINERY COMPANY, LIMITED
TORONTO, MONTREAL, WINNIPEG, VANCOUVER, HALIFAX, ST. JOHN, N.B. BUFFALO.

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

THE
ST. LAWRENCE WELDING CO.
LTD.
MONTREAL, QUE.
A. M. BARRY, Managing Director
Office and Works:
138-140 Inspector Street
Telephone Service:
(Long Distance) Main 5779 and at Night, Westmount 3483
Maritime Branch:
HALIFAX, N.S.

CONSULTING ENGINEERS on all kinds of welding.
BREAKDOWN REPAIRS handled at once; just 'phone us and we will be on the job by next train.
OXY-ACETYLENE WELDING of heavy cast iron frames, cylinders, gears, water wheels, etc.
STEEL, any kind of **welding** on parts of large or small machines, tanks, digesters, boilers, shafts, brackets, etc.
Can be welded in place when necessary.
ELECTRIC WELDING on boilers, digesters, leaking tanks, etc.
MARINE REPAIRS undertaken by our Marine Welding Tug which is equipped with Electric and Oxy-Acetylene Welding Apparatus with Compressed Air Plant complete.
OXY-ACETYLENE CUTTING of any kind of steel construction.
PORTABLE WELDING APPARTUS of all kinds with skilled operators always available to repair your breakdown at once.
THERMIT WELDING on all classes of work is a special feature of present activities.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, etc.; Electric Welders, Oxy-Acetylene Welders, Boiler Repairs, Lead Burning and Thermit Welding.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.I.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

Lake copper	$19 50	$18 50
Electro copper	18 50	17 50
Castings, copper	18 50	17 00
Tin	58 00	55 00
Spelter	8 50	8 25
Lead	6 50	7 50
Antimony	9 00	8 50
Aluminum	38 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$11 50	$11 25
Copper, crucible	14 00	14 00
Copper, heavy	13 50	14 00
Copper wire	13 50	14 00
No. 1 machine composition	12 50	13 00
New brass cuttings	9 25	9 00
Red brass turnings	8 00	9 00
Yellow brass turnings	6 25	6 50
Light brass	5 00	5 00
Medium brass	7 00	6 00
Scrap zinc	5 00	5 00
Heavy lead	4 00	4 00
Tea lead	3 00	3 00
Aluminum	15 00	12 00
	Per Ton	
Heavy melting steel	9 50	9 00
Shell turnings	6 00	6 00
Boiler plate	10 00	8 00
Axles (wrought iron)	17 00	15 00
Rails	12 00	11 00
Malleable scrap	12 00	12 00
No. 1 machine cast iron	15 00	15 00
Pipe wrought	6 00	5 00
Car wheels	20 00	18 00
Steel axles	20 00	20 00
Mach. shop turnings	5 50	5 00
Stove plate	12 00	10 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, ¾" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	45
Elevator bolts	25
Machine bolts, 7-16 and over	25
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list plus	15
Burrs only, list plus	40
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	75
Wood screws, O. & R., bright	70
Wood screws, flat, brass	40
Wood screws, O. & R., brass	.5
Wood screws, flat, bronze	30
Wood screws, O. & R., bronze	27½

MILLED PRODUCTS

	Per Cent
Set screws	25
Sq. and Hex. Head Cap Screws	20
Rd. and Fil. Head Cap Screws	net
Flat But. Hd. Cap Screws	plue net
Fin. and Semi-fin. nuts up to 1 in.	25
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add 7 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

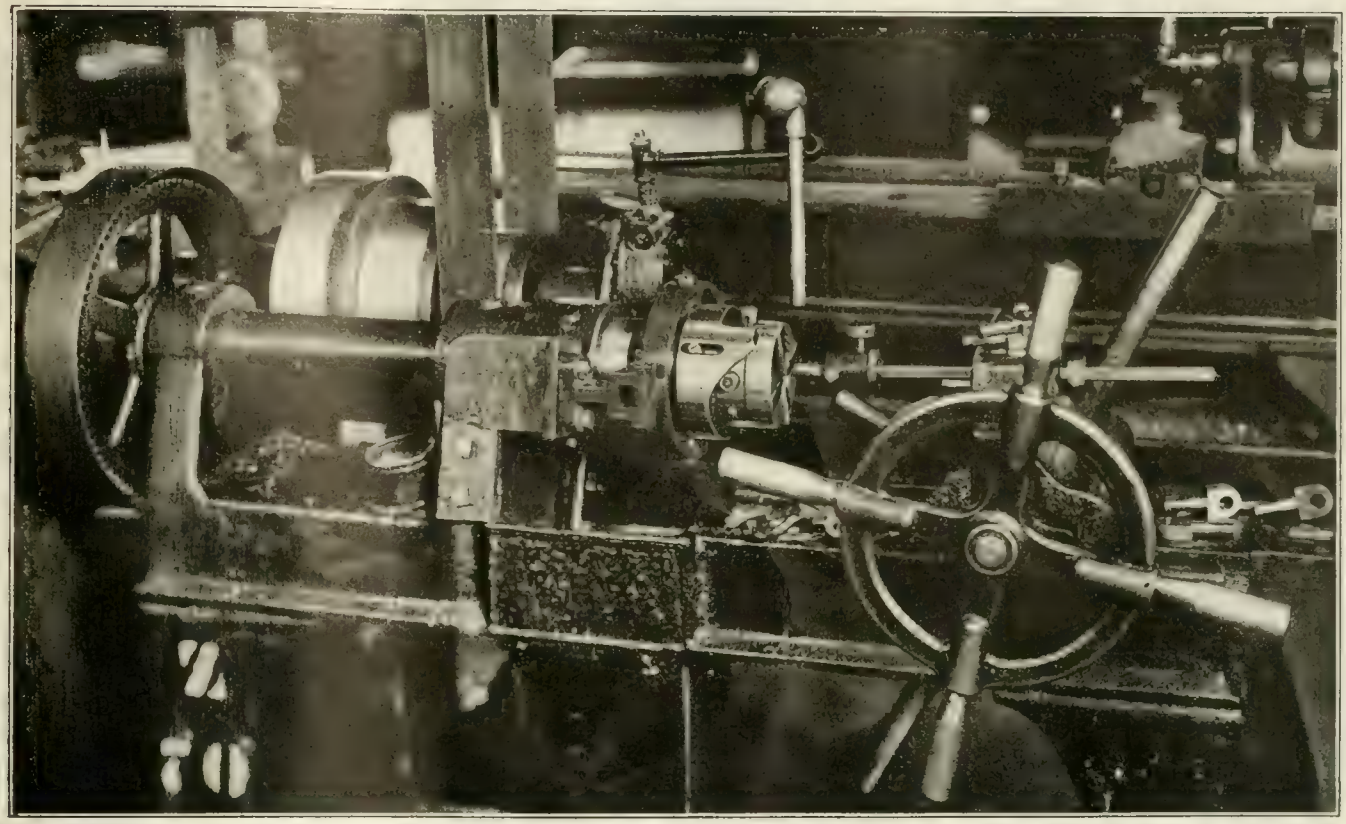
ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

BROUGHT UP TO DATE



This old Bolt Cutter has been turned into an up-to-date Threading Machine by the application of a Geometric Die Head.

The Connecticut Telephone Company removed from this Bolt Cutter the solid die head with which it was equipped, and put in its place a Geometric Self-opening Die Head of the type regularly furnished on the Geometric Threading Machine.

Thread is 7-16" diameter, 14 U.S.S., about 1" long, on switchboard terminals of a high class copper casting.

The best part of it is, that besides getting clean, sharp threads, they have increased the work about six times over what was being accomplished with a solid die head.

Has any threading operation been given the right chance unless a Geometric figures in it?

The Geometric Tool Company, New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	35
S.S. drills, wire sizes, No. 53 to 80	40
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	40
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 40
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	75
High speed cutters, list plus	40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	8 00
Can. plates, all bright	8 50	9 00
Apollo brand, 10¾ oz. galvanized		
Queen's Head, 28 B.W.G.		
Fleur-de-Lis, 28 B.W.G.		
Gorbal's Best, No. 28		
Colborne Crown, No. 28		
Premier, No. 28 U.S.		7 95
Premier, 10¾ oz.		8 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅞ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.		45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS

Brass rods, base ½ in. to 1 in. rod	0 30
Brass sheets, 24 gauge and heavier, base	$0 38

WASTE

Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

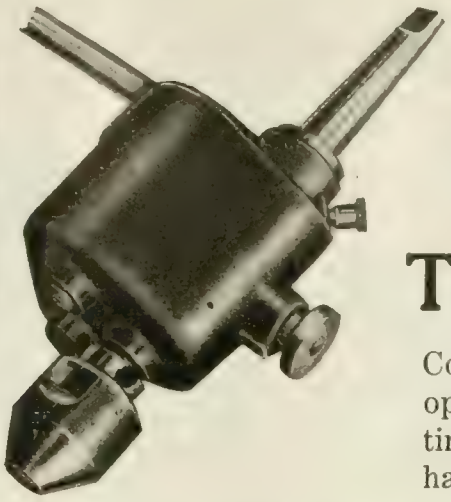
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$.25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	-
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.

Aikenhead's Wahlstrom Attachment



will make a deep cut in your Tapping Cost

Controlled by the average operator, it will tap 10 times more than an expert hand-tapper.

Its mechanically obtained **oscillating movement** imitates hand-tapping—and it actually reduced tap breakage.

Its quality construction means a long lasting good service. Nothing about this attachment can get out of order. Takes taps of all sizes up to ½ inch, and is attachable to every type of drill press.

Order one on trial. Your money promptly refunded if you are not satisfied.

Send for Bulletin.

AIKENHEAD HARDWARE, LIMITED

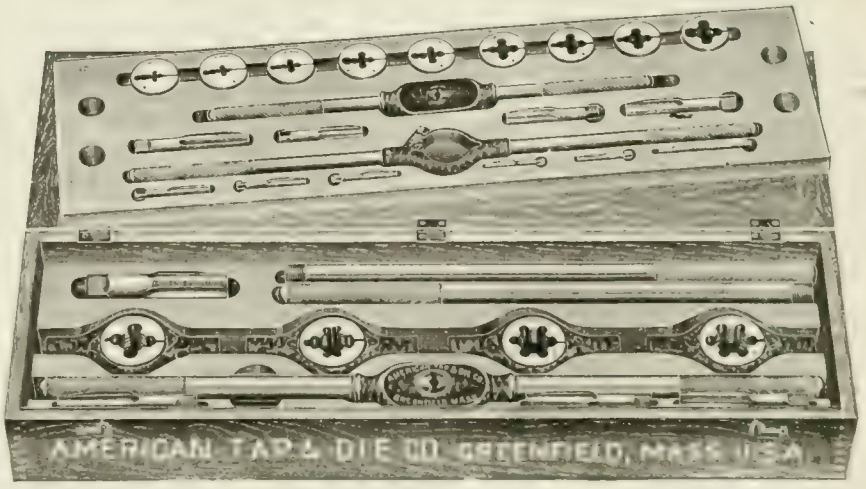
17 TEMPERANCE ST., TORONTO

Buy from Aikenhead's stock of

Bolt Stocks, Taps & Dies

It comprises the very best lines that is possible for us to secure. Call on us to supply your needs and you are sure to get the best of service and satisfaction.

Send for Bulletin.



AIKENHEAD HARDWARE, LIMITED

17 TEMPERANCE ST., TORONTO

markets and new connections. Mr. Harris made it very plain that the Canadian manufacturers should be prepared to meet the situation. "If the Greek mission comes," he said, "and finds that your goods and prices are right, and agrees to buy, how are you going to meet the situation? We have no shipping. Our job is to sell a billion dollars' worth of Canadian goods a year. We can get them to the seaboard and there we are stuck. But if we have 25,000 tons of Greek shipping coming here every month for wheat we may be able to slip something else into those boats."

Other Markets Open

According to the Canadian Trade Commissioner there are other markets open if the Canadians will get after them. There is Australia and South Africa, and neither of them drawing as heavily as before on the British market. Then there is Scandinavia, Denmark, Holland and Spain. These countries are all in good shape. "But bear in mind," continued the speaker, "that the trade mission is no glorified commercial traveller. We find out what the representatives of Canadian firms have when they come to us, and we are willing to direct him to where he can sell to the best advantage. And if you are going to send any person out to look for business in new markets send some person who knows your business technically. Never mind at the start if he is a salesman or not. All these countries require goods peculiar to their own requirements. The heads of concerns should go themselves, or ome of their best technical men. Go into this field as though you were going to make it something permanent. Study it and find out what is wanted. Canada has the greatest reputation in Europe of any nation. That reputation has been made chiefly by the men who went to the front, and it was made by reason of the fact that all the smaller nations feel that the Canadians went although they didn't have to do it. Now they think that the reason we want to open business with them is because we want to help them. It is impossible without visiting these little states to know the amount of political intrigue that goes on to get domination in trade matters. Germany dominated the Balkans in a way that was remarkable. Other nations are out now after the same sort of domination. If we can take hold and give these people the necessary credits we can have the trade and along with it the finest goodwill in the world. The soldiers have done their part, and now it is up to the commercial men and the bankers to maintain the reputation made by the men at the front."

In concluding his address, Mr. Harris referred to the discouraging conditions that had awaited him in Canada. This, he said, should be the happiest country in the world. and we should have the most efficient labor in the world. By the time the reports of what is going on in this country get back to Europe it will appear that we are as bad off as they are in Russia. "I hope," he concluded, "that capital and labor will be big enough to get together and settle this trouble. Capital cannot always have its own way, and labor cannot always have its own way. We must be big enough to get down to a basis where we can compromise. We need men with vision, breadth of thought, and then we will have no fear of the future."

Metric System Would Save Year in School

By Metricus

READING in CANADIAN MACHINERY for May 22 a discussion on the pros and cons of the metric system, has induced me to write, briefly perhaps, on the same subject, with the aim of starting a discussion tending towards the bringing out of the different shades of opinion held by Canadian engineers and manufacturers on this most interesting topic.

It is idle to suppose that our English system(?) of weights and measures will for long exist in its present cumbersome form, and it seems to me that the present time of flux and change in all things long established would be a most opportune time for either the rationalizing of our English system of weights and measures or the adoption outright of the metric system.

The disadvantages of the inch and all its multiples and fractions as a means of measurement in the machine shop, in the factory, in surveying, and in all else of an engineering nature are only too obvious. The fractional parts of an inch are at best very difficult to work with when compared with the ease and facility that goes with the manipulation of the millimeter and its smaller decimal parts. No one will think of expressing to close limits required to-day in machine shop practice as so many fractional parts of an inch, and why adhere to the cumbersome sixty-fourth and thirty-second for rougher work?

The advocates of the inch, etc., may counter to the above statement that this in itself is no argument for the metric system, and that where required it is easy enough to employ decimal points of inch measurements. This in itself is sound logic, but the advantages of a decimal system do not end here. It is in the conversion of inches into feet, yards and higher units that inconvenience is encountered. Many other English units of measurement are more honored by neglect than observance; the rod, the chain, the pole and furlong are all forgotten by most of us since having graduated from the schools of our youth.

We all remember the agony and mental effort required to learn, 12 inches equals one foot, 3 feet equals 1 yard, 5½ yards equals one rod, 320 rods equals one mile, and similar relations telling us what a hand is, what a knot is, a fathom, a chain and how many links it has and what they are. By the way, I obtained this table from a public school arithmetic in the possession of the younger members of the home circle and I must confess that many of the names are Greek to me. Nor do I see any indication as to how long a furlong is.

When it comes to square measure, the equivalent table is confusion worse confounded. Aside from the confusion arising through the squares of arbitrary numbers necessary in expressing equivalent areas another unit, the acre, is introduced and we still have square rods, square links and square chains, also quarter sections.

Cubic measurement again is still more complicated, for while cubic inches, feet and yards are expressed in a comparatively simple manner, and have a number of other tables all dealing with volume and all with no direct relation to the others. Dry measure and liquid measure both introduce excessive complications into man's existence and the writer to-day is unable to remember just how many quarts of liquid refreshment there are in the various sized barrels seen on the brewer's wagon. Possibly this information will become increasingly useless however, and the only reason why the old wine measure will exist is because it is still the standard measure of volume in the United States, much to our confusion in matters pertaining to hydraulics.

An instance in illustration of this fact may be related in the experiences of a milk dealer not many miles from Toronto. A glib salesman from one of the glass companies across the border sold him some thousands of milk bottles and of course they were made to the U.S. gallon. This fact was not discovered(?) until the milk inspector confiscated the whole lot, much to the discomfiture of the milk dealer, and to the expense of his pocket book, in more ways than one.

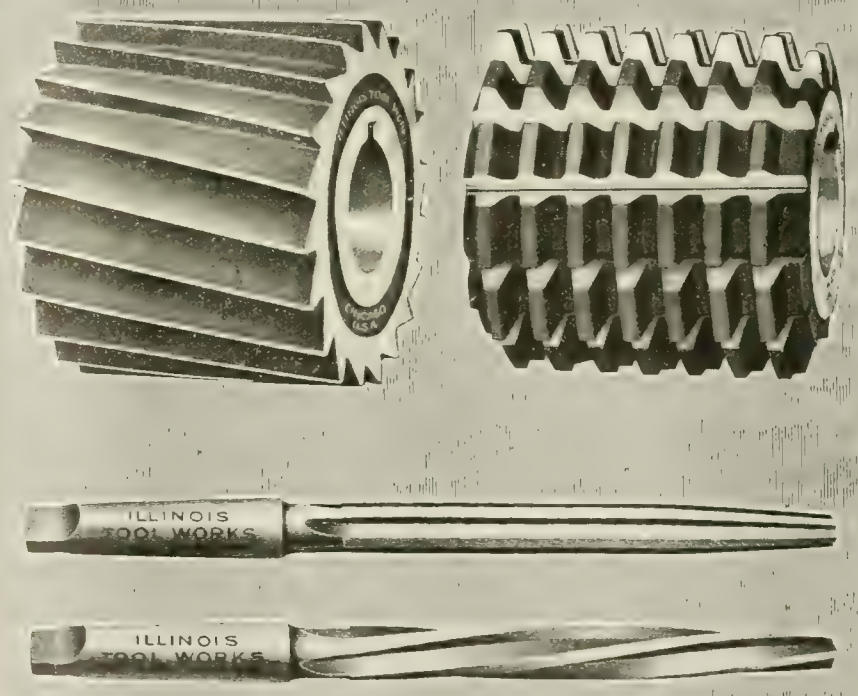
This is perhaps wandering far afield from a discussion of the merits of the metric system in commerce and industry, but it is sufficient illustration of some of the inconveniences we have to put up with, and is illustrative of the waste of time which occurs in the schooling of the younger generations.

By the proper education of youth in the metric system it has been estimated that about a year of school life might be saved to the earlier starting in industry of the schoolboy or to his advantage in the obtaining of further technical education, something which he admittedly needs.

ILLINOIS

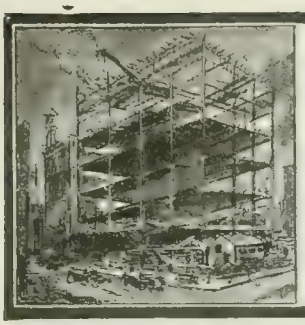
CUTTERS
H O B S
REAMERS

NONE BETTER CAN BE MADE



ILLINOIS TOOL WORKS
CHICAGO

Detroit Store: 997 Woodward Avenue, Represented by A. C. Towne, Inc., Buffalo. New York Office: 141-145 West 36th Street. Lewis G. Henes, Monadnock Bldg., San Francisco, and Title Insurance Bldg., Los Angeles.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



INCORPORATIONS

The Donald Shipping Company, Ltd., capital stock of $30,000 in 300 shares of $100 each, has been formed to carry on a general shipping and merchandising business. Head office in Montreal.

The Mount Royal Rubber Company, Montreal, has been formed with a capital of $500,000 in 5,000 shares of $100 each. The company will manufacture rubber boots, shoes and rubber goods generally. D. Lorne McGibbon is one of the incorporators.

The Ontario Abrasive Wheels, Ltd., has been incorporated with headquarters at Prescott, Ont. The capital will be $30,000, divided into 300 shares of $100 each. The company will manufacture and deal in all kinds of abrasive wheels and stones.

The British Wrecking and Salvage Company, Ltd., has been incorporated with a capital stock of $2,000,000 in twenty thousand shares of one hundred dollars each. The head office will be in Montreal, and the chief objects of the company will be to carry on a wrecking and salvaging business in all its branches.

The Spardon Electrical Products Company, Limited, has been incorporated with a capital stock of $50,000, divided into 500 shares of $100 each, to manufacture electrical and mechanical signals, and signal systems of every description. The head office will be in Ottawa.

MARINE

Portland Me.—The building of schooners in this district is still a live industry, and the price of hulls is still rising. The expected drop following the war has not yet materialized, and in spite of the numbers launched, there is a demand for more. New vessels receive charters as soon as they are ready for sea.

San Francisco.—The Pacific American Steamship Association was formed here recently, combining all the American shipping interests on the Pacific coast with the exception of the lumber carriers. Captain Robert Dollar was elected president, and A. F. Haines of Seattle, vice-president.

Ottawa.—The pulp and paper manufacturers have approached the Dominion Government with a view to having two of the new Government freighters turned over to them. The idea is to establish a bi-monthly service, the vessels obtaining their cargo at the various pulp and paper mills on the St. Lawrence.

Victoria.—The "Western Knight," an 8,800-ton steamship, built by the Ames Shipbuilding Company, has had to discontinue her voyage to Japan and return to Seattle on account of springing a leak. No details are known, but it is probable that a plate has sprung. The leak must be a bad one to make it necessary to discontinue the voyage.

Ottawa.—The Minister of Marine at a meeting with the Canadian Marine and Labor Federation, told them that the Government could not pay war prices for future ships. He expected to bring his further shipbuilding programme before the House very shortly. He thought the prices should be from $15 to $20 per ton less than war rates.

Port Arthur.—The C.P.R. steamer Assiniboia took off the crew of the lake steamer Schlesinger, which was in a sinking condition 35 miles off Passage Island, and sank soon after the crew had been transferred. She was owned by the Massey Steamship Company of Superior, Wis., and was a 3,500-ton boat. She had a cargo of 2,000 tons of coal, and her sinking was the result of a leak.

London, Eng.—An effort to arrange a direct steamship service from Montreal to Scandinavian ports is being made by some Montreal manufacturers, and the question is to be taken up with Sir Robert Borden on his return to Ottawa. H. A. Vineberg, a Montreal man who has just returned from Norway and Sweden, says there are good opportunities for trade between Canada and those countries.

Kingston. — The Collingwood Shipbuilding Company has made an agreement with its employees giving them an eight-hour day and an increase in wages. For mechanics the minimum wage is 75 cents an hour, helpers to 47½ cents an hour, painters are to receive not less than 45 cents an hour, while the pay for all other workmen will be raised proportionately.

Welland.—The yard of the British American Shipbuilding Company at Welland has been closed down till further notice. The company offered the striking employees a 44-hour week and a 10 per cent. increase, which was refused. The company then notified the men that they would be compelled to close down the works, as they could not meet the demands of the men and still build ships profitably.

Vancouver.—Suit has been brought against three shipbuilding firms, the Northern Construction Company, the Pacific Construction Company of Coquitlam, and the New Westminster Construction and Engineering Company, by Raymond Van Hemelryck. The latter is a Belgian shipowner who placed contracts for sixteen 3,200-ton wooden steamers with the firms, and is now suing for the return of monies paid on the uncompleted contracts.

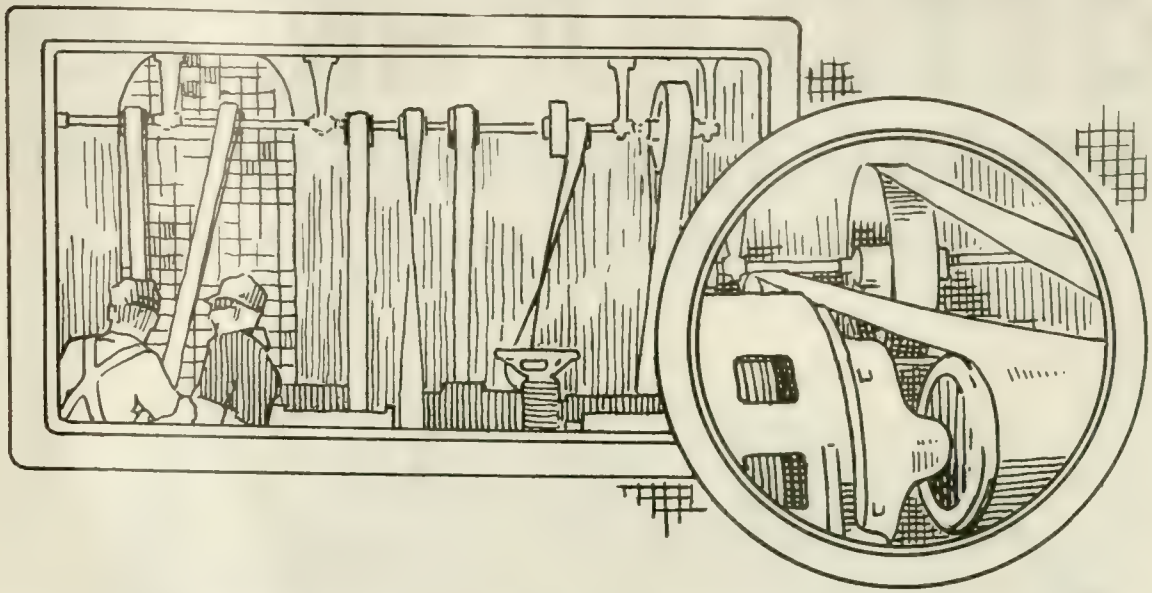
St. Catharines.—The Burma, a wooden barge, struck the pier on the west side of Port Dalhousie harbor entrance and sank shortly after. The pier was damaged where the barge struck it. Navigation will not be interfered with.

Toronto.—The "Concretia," the first concrete ship to be seen in Toronto, was a visitor here recently. She was built at Montreal last year, and completed at Prescott. She is 120 feet long by 11 feet 3 inches deep, and can make about eight knots an hour.

Vancouver.—The wooden steamers being built in British Columbia will perhaps be taken over by Sir James Ball, the British Columbia commissioner, for the transportation of the 75,000,000 feet of lumber to the United Kingdom. There is nothing definite known in this connection, but it is understood that the probability of such an arrangement that enabled Sir James to make the announcement that he had the necessary tonnage to move half the order in the next six months.

Victoria.—Bayly Hipkins, vice-president and manager for the North-West district of the Foundation Company, on a recent visit here, made the interesting announcement that the material for the completion of the twenty French ships under contract at the Victoria yard had all been purchased. The Ogden Point plant pleased Mr. Hipkins by the organization displayed, and he expressed himself as confident that the outfitting department would be able to catch and keep up with the construction department.

London.—At the annual meeting of the Cunard Steamship Co. some interesting figures were given. The company lost forty-five ships of a total tonnage of 389,353 tons. They carried during the war 900,000 troops and 10,000,000 tons cargo. The company's engine shop at Bootle on the Mersey was turned into



Our System of Testing Insures Uniformity and Dependability in Dominion Rubber System Belting

Probably the elements that create the most satisfaction in the use of any article are an accurate knowledge of what it will do before it is made and to prove that it will efficiently accomplish its purpose after it is made.

It is on this basis that we build our belting and the knowledge of what it will do is the result of over fifty years experience and research.

We prove by careful tests that every ounce of material is up to our high standard—each individual operation is checked as the belt proceeds from one machine to the next and a sample of the finished belt is tested, both chemically and physically, to prove that it will efficiently serve the purpose for which it was made and that it has a reserve of strength for emergencies.

We want you to test not only our claims of superiority for Dominion Rubber System belting, but our free belting service, in charge of belting experts, who can help to cut your manufacturing costs, by making your equipment more efficient.

A phone, wire or letter to our nearest service branch will enable you to test this service without obligation.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

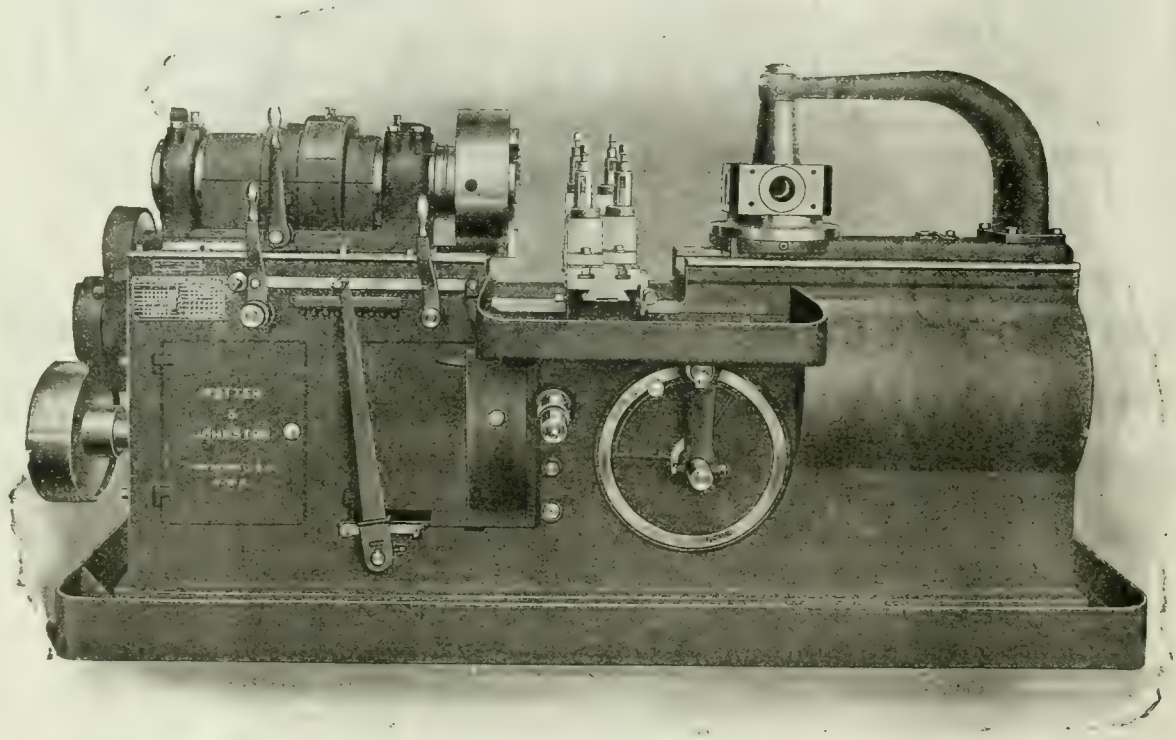
Service Branches:

Halifax, St. John, Quebec, Montreal, Ottawa,
Toronto, Hamilton, London, Kitchener, North Bay,
Fort William, Winnipeg, Brandon, Regina, Saskatoon,
Edmonton, Calgary, Lethbridge, Vancouver, Victoria.

POTTER & JOHNSTON

MANUFACTURING AUTOMATICS

Increases the Output and Reduces the Cost



6-A Potter & Johnston Automatic Chucking and Turning Machine

6-A Potter & Johnston Automatic Chucking and Turning Machine

Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle 5¾ inches diameter, hole 3½ inches diameter.

DO IT AUTOMATICALLY

All operations are entirely automatic. One attendant can readily run a battery of two to six machines.

In addition to automatically machining all varieties of castings from iron, bronze or steel, also forgings, the machines are also recommended and are widely used for finishing pieces from bar starch which have previously been cut off to length. This is a highly economical method of producing gear blanks, bushings, studs, etc.

Catalog gives full particulars. ***Drop a card for it.***

Canadian Offices: POTTER & JOHNSTON MACHINE CO., Pawtucket, R.I.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada

Works and Warehouse: Galt, Ont., Canada

WOLFRAM
HIGH SPEED STEEL

VULCAN
TOOL STEELS
for Every Purpose

Vulcan Special Vanadium—For Punches and Dies. Has wonderful wearing qualities.

Vulcan Non-Shrinkable—For Intricate Dies. Does not warp. Does not shrink.

Vulcan Regal No. 2—For Fine Finishing Tools. The highest grade tungsten finishing steel.

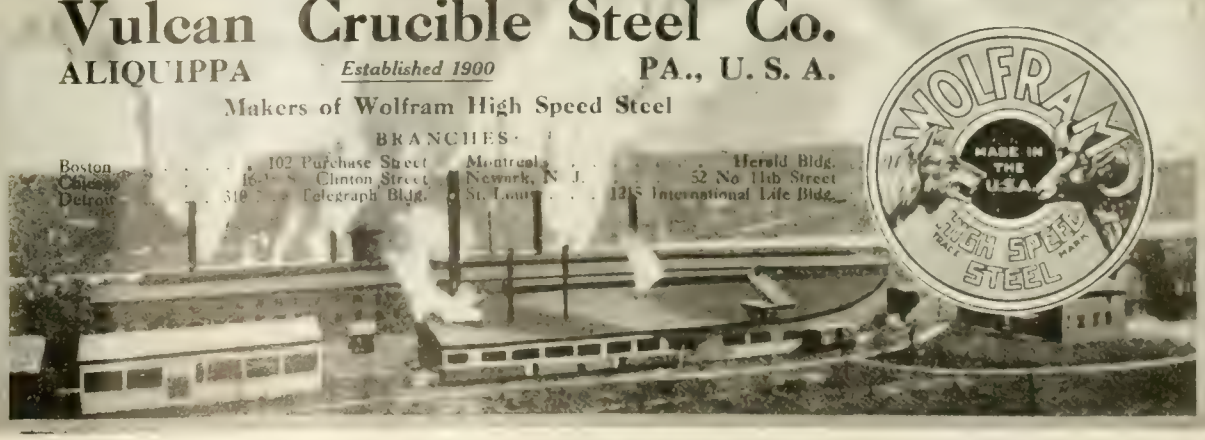
Vulcan Hecla—For work requiring great strength. The first high grade Chrome Vanadium steel produced in America.

WRITE FOR CATALOGUE

Vulcan Crucible Steel Co.
ALIQUIPPA *Established 1900* PA., U. S. A.
Makers of Wolfram High Speed Steel

BRANCHES

Boston	102 Purchase Street	Montreal	Herald Bldg.
Chicago	Clinton Street	Newark, N. J.	52 No. Hub Street
Detroit	Telegraph Bldg.	St. Louis	International Life Bldg.



a shell shop, employing 1,000 people, of whom 90 per cent. were women. Over 400,000 shells were turned out here. The company's assets were $75,000,000, and they own or control 558,380 tons gross register, and have 426,800 under construction.

Quebec.—The Minister of Marine, Mr. C. C. Ballantyne, made a visit of inspection here recently. He went first to the yard of the Davey Shipbuilding Co., Lauzon, where two 5,100-ton steamers of the Canadian Government's programme are building, and expressed himself as being well satisfied with the progress made. The minister then visited the Port of Quebec and the Louise Docks, and also inspected the proposed site for the new Government cold storage plant. The minister is taking this question up with the Minister of Finance, and if funds are available the plant will be included in the estimates for the present year.

Detroit.—The "Lake Gravity," built at the Detroit Shipbuilding Company yards sailed recently for Hamburg direct. She sailed under sealed orders but her destination was more or less of an open secret. She carried a cargo of United States merchandise to the German port.

St. John, N.B.—The "War Moncton" was launched from the yard of Messrs Grant & Horne recently. She is a wooden steamer of 2,800 tons built for the Imperial Munitions Board, and is a sister ship to the "War Fundy" launched last year. The "War Moncton" has been seven months on the stocks, and was launched with boilers installed. The engines will be installed by the Union Foundry

PERSONAL

Drummond and McCall, iron and steel merchants, of Montreal, are now located in their new offices on the fifth floor of the Mark Fisher Building.

R. McLeah has been appointed steam engineering expert with the Montreal General Tool Co., Canadian manufacturers for the Talbot Contra-flow steam boilers and Uniflow engines.

TENDERS

The Department of Railways and Canals are calling for tenders to be marked "Tender for rebuilding lower entrance pier lock No. 25" on the Galops Canal. Tenders will be received up till Wednesday, June 4. Plans and specifications can be seen at the Department in Ottawa, or at the office of the superintending engineer, Cornwall, Ont.

The Department of Public Works is calling for tenders for the construction of medical officer's residence, pump house, and vocational building, Dalton Sanitarium, North Wiltshire, P.E.I. Tenders must be addressed to the Secretary, Department of Public Works, and must be received by June 5. Plans and specifications can be obtained at the office of the Chief Architect, Department of Public Works, Ottawa, and Superintendent of Military Hospitals, Charlottetown, P.E.I.

The Board of Education of Toronto want tenders for all trades required in the erection of new school buildings at Glengrove Avenue and Glenholme Avenue. Specifications and all necessary information can be obtained from the architect, D. R. Franklin, 2 College Street, Toronto.

TRADE GOSSIP

New Factory for Oshawa.—A factory, which will employ about 100 men, will be erected in Oshawa by the Ontario Steel Products Co., Ltd.

New Reception Home.—The City of Toronto will shortly erect a new reception home. This was decided at a recent meeting of the Board of Control.

Windsor Gets New Industry.—A $250,000 factory will be erected at Windsor, and employ about 100 hands. It will be the home of the Champion Spark Plug Company.

New Steel Company.—A company has been formed with offices at Calgary, Alta., with a capital of $2.000,000. It will be known as the Canadian Western Steel Corporation, Ltd.

Hamilton Gets New Factory.—The Hoover Suction and Sweeper Co., of Dayton, Ohio, are building a three-storey factory in Hamilton, Ont., for their Canadian headquarters.

Big Marine Orders.—Orders for marine forgings, sufficient to keep the plant going full for several months, have been received by the Canada Forge Co. This is a good indication of the revival of the steel business, which has been slack since the armistice.

Eight-Hour Day.—The Curtiss Aeroplane and Motors, Ltd., commencing June 2nd, will give their men an eight-hour day with 9 hours' pay. The plan was explained to the men at the noon hour, and was received with much evident satisfaction on their part.

Settling Up War Contracts.—In a special report by Benedict Arnold, U. S. Assistant Secretary, the statement was made that the work of settling up contracts which were terminated or curtailed by the armistice was about 75 per cent. completed.

The Vancouver Dry Dock.—H. H. Stevens, M.P.P. for Vancouver Centre, and S. J. Crowe, Burrard, B.C., have notified the Vancouver Board of Trade that if no private company could be found to undertake the building of a dry dock, the Harbor Board would themselves take it up.

Sell Food at Cost.—"The Cleveland Milling Machine Company have opened an employees' restaurant, in which it will sell food at cost price. This restaurant was designed with the view of accommodating three hundred (300) people and has the most up-to-date kitchen facilities to prepare regular, as well as short order meals.

Hydro Buys Thorold Plant. — Mr. James Battle of Thorold has disposed of his electric power and transformer plant to the Hydro-Electric Power Commission. The price was $100,000 in four per cent. bonds. It is likely that the town will take over the plant. Mr. Battle had a 26-year contract with the Ontario Power Company.

C.P.R. Depot at Moose Jaw.—The Canadian Pacific Railway is going to build a new depot in Moose Jaw at a cost of $250,000, according to an announcement made by E. W. Beatty, the president of the road, on a recent visit. The Building will be of stone and will be located in direct proximity to the present depot. Work will be started this year.

Brampton Veterans Organize.—A joint stock company has been formed by the G.W.V.A. to be called either Peel Veterans, Ltd., or Brampton Veterans, Ltd., with a capital of $50,000, with headquarters at Brampton. The object of the company is to erect a three-storey building with three stores on the ground floor, offices above, and club rooms above that.

Tug was Lost.—The marine tug Albert C., fitted out by the St. Lawrence Welding Co., for harbor and ship repair work, which was thrown ashore on the Dartmouth side of the Halifax Harbor, was so badly smashed that she has been abandoned by the owners; she was fully insured. It is the intention of the company to replace the tug by a special electric welding outfit mounted on a truck for marine service.

Arnprior Mills Extend. — A large amount of new machinery has been purchased and has arrived at the plant of the Kenwood Mills, Ltd., Arnprior. Mr. H. M. Ashby, executive manager for Huyck & Sons, Albany, and the Kenwood Mills, Ltd. Arnprior, stated that the Canadian field look so promising that he expected the Arnprior Mills to be larger eventually than the plant in Albany, which covers several acres and employs hundreds of hands.

British Industries Fair.—The British Industries Fair, to be held in London, Glasgow and Birmingham in 1920, will be open for the exhibits of any Canadian company not controlled by foreign capital. The fair will open on February 23 and close on March 5. At the last fair, orders for $10,000,000 of goods were placed. The British Trade Commissioner, F. W. Field, is making arrangements for Ontario manufacturers, and information can be obtained from him.

Government to Build Roads.—Mr. W. A. Maclean, the Deputy Minister of Highways, has stated that most of the work on the provincial roads this season will be done by day labor. Tenders for the work were called for originally with a view of doing it by contract, but when the tenders were opened it was found that the prices were 50 per cent. higher than expected. Under the circumstances and in view of the fact that the contracts would extend over a long period, it was decided to do the work over again.

Service to Newfoundland.—The Department of Trade and Commerce has announced that they have entered into

contract with the Gulf of St. Lawrence Shipping and Trading Company, 147 Mountain Hill, Quebec, P.Q., for a steamship service between Montreal, Quebec, P.Q.; Charlottetown, P.E.I.; Sydney, C.B.; and St. John's, Newfoundland. Two trips per month will be made in each direction, the service to commence about the end of May and continue until the close of navigation in the present year. The steamer is a 1,500-2,500 gross ton type with a speed of ten knots. It has accommodation for fifty first class, thirty second class and forty third class passengers. In view of the present difficulties in securing a proper service to Newfoundland, the inauguration of this service will undoubtedly be of great assistance.

Buy Coal Now.—The Canadian Manufacturers' Association are sending out the following circular in regard to bituminous coal: As in the past two years, we again urge our members, in order to avoid congestion at the frontier in the fall and winter, to put in their season's requirements of bituminous coal in the summer months. Another factor which points to the wisdom of early action is that, as a result of shortage in the labor supply, production of bituminous mines shows a marked falling off. They are now running about 7,000,000 tons per week, as compared with 12,000,000 tons per week during the war. This condition leads to the belief that production is less than concurrent consumption, the difference being accounted for by the use of reserve stocks, accumulated at the instance of fuel administrations.

Company Reorganized.—The recent reorganization of the St. Lawrence Welding Co., of Montreal, places the control of the company in the hands of W. H Barry and A. M. Barry, president and general manager respectively; F. E. Fox being appointed a director and secretary-treasurer. L. E. Moulton is also a director of the new firm. The plant here has been enlarged and a well-equipped machine shop added to carry out the complete repairs of all welded work. A staff of boiler makers is, likewise, a part of the new organization. Every class of welding work is carried on and the firm make a specialty of oxy-actylene and electric welding repairs. They have recently purchased a new portable electric equipment for operations between Halifax and Montreal. During the present season a brisk business has been carried on, considerable repairs having been performed to the troop ships entering Halifax.

The University of Illinois, Engineering Experiment Station, have issued bulletin number 108 dealing with the analysis of statically indeterminate structures by the slope deflection

N. SMITH BELTING
138 YORK ST. TORONTO

PATENT ATTORNEYS

RESEARCH BUREAU
REPORTS BY EXPERTS ON SCIENTIFIC, TECHNICAL AND INDUSTRIAL DEVELOPMENT.
SPECIAL RESEARCHES ARRANGED.
PATENTS, TRADE MARKS, ETC
HANBURY A. BUDDEN — CABLE ADDRESS
DRUMMOND BLDG MONTREAL — "BREVET"

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
Booklet Free.

PATENTS TRADE-MARKS AND DESIGNS
PROCURED IN ALL COUNTRIES
Special Attention given to Patent Litigation
Pamphlet sent free on application.
RIDOUT & MAYBEE Kent Bldg., Yonge St.
TORONTO, CANADA

PATENT
YOUR INVENTIONS
Send direct to Ottawa for free patentability report and booklet "Patent Protection." Clients' patents advertised in the "Patent Review."
Harold C. Shipman & Co. PATENT ATTORNEYS
CENTRAL CHAMBERS, OTTAWA, CANADA.

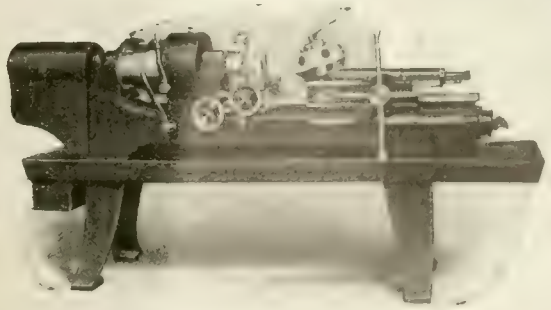
CASTINGS
Medium Weight Grey Iron, Brass, Etc.
JOBBING
GREENLEAFS, LIMITED
Belleville, Ontario

BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Kernchen Siphonage Ventilators, Bakers Ovens, trucks, casters, etc.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

Paper Mill Machinery
BERTRAMS LIMITED
SCIENNES EDINBURGH

MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE — WORKS: MUSKEGON HEIGHTS U.S.A.

THE TILTED TURRET
A CLEAR TRACK FOR THE STOCK



THE TILTED TURRET Lathes and Screw Machines
are accurate and productive. Made in twelve different sizes.
Ask the Users.
Send for Catalog "C"
WOOD TURRET MACHINE CO
BRAZIL INDIANA U.S.A.

Service Quality



Steel of Every Description for Every Purpose

"HAWK" VANADIUM TOOL STEEL

This steel is the finest quality of straight carbon tool steel that modern crucible practice can produce. Only the finest raw materials are used and these are treated throughout the manufacturing process in a manner which **means money** to you.

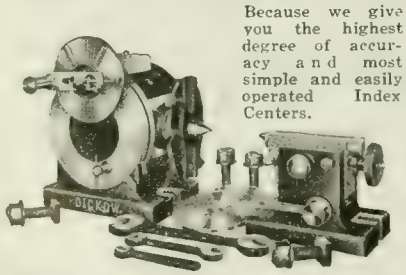
Can be furnished in all tempers and finishes to meet your requirements.

Large stock. Prompt shipment. For full particulars, write.

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass.
Storehouses: MALDEN, MASS.

More Production
Dickow's 10-Inch Universal Index Center



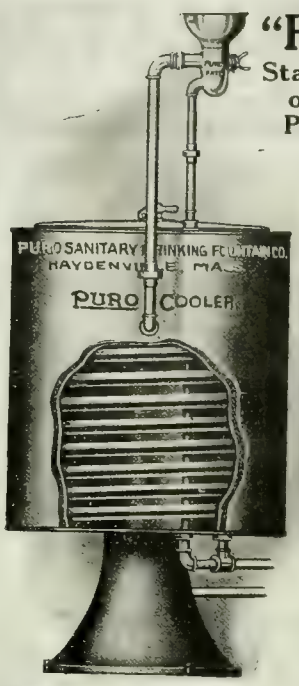
Because we give you the highest degree of accuracy and most simple and easily operated Index Centers.

PROMPT DELIVERY
For Accuracy Get Dickow's
Sold by dealers. Write us to-day.
Fred. C. Dickow, 37 So. Desplaines St. Chicago, Ill.

method. This bulletin has been compiled by W. N. Wilson, F. E. Richart and Camillo Weiss. Frames composed of rectangular elements must in general be designed with stiff connections between the members at the joints, in order that loads may be carried. These connections must be capable of transferring not only direct axial tensile and compressive forces, but also bending moments.

It follows that frames made up of rectangular elements are usually statically indeterminate; that is, the stresses in them can be found only by taking into account the relative stiffness and deformations of the various members. The common use of rectangular frames in engineering structures makes it highly desirable that the most convenient methods of analyzing their stresses should be developed. This bulletin describes the methods used and presents the formulas derived.

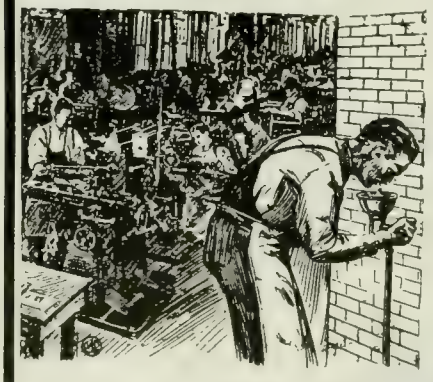
THE "FLU" Stayed out of this PLANT



PURO SANITARY DRINKING FOUNTAIN
(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish Influenza. PURO saves lives, time and vater. **Write**

Puro Sanitary Drinking Fountain Co.
147 University Ave., Toronto, Canada



PLEWES Limited
WINNIPEG
For All
Machinists' Supplies

Open Montreal Office.—The International Machinery and Supply Co., Ltd., incorporated in March of this year, has recently opened offices at 371 St. James St., Montreal. They will carry on a general engineering supply business, in railway, industrial and marine activities. W. J. Carrigan is the managing director of the company, and J. T. Dohm has been appointed general sales manager. Mr. Carrigan started his engineering career with the old McGregor Gourlay firm of Galt about 15 years ago. After serving with this firm for two years he engaged with the engineering firm of White & Son, of London, for four years. He then wandered around a bit gathering experience in such places as Guelph, Peterborough, Smiths Falls, and Hamilton. He finally associated himself with the Canadian Steel Foundries in their Welland plant, remaining there for five years. He resigned his position last November and this spring was appointed to his present position. He is likewise president of the Canadian Chadwick Metal Company of Hamilton, Ont. J. T. Dohm was travelling representative for the Dupont Engineering Company for seven years, and in 1907 joined the staff of the White Motor Cars, of Chicago and Cleveland, as traveling representative of the School of Instruction. After three years with this firm he became associated with the Johns Manville Co., of Milwaukee, and was assigned to Western Canada. He then joined the Garlock Company and served with them for about two years, resigning when the American Company absorbed the Canadian Company. After serving for some time as Western Canada representative of the Willis Motor Company, he was appointed as manager of the Toronto branch of the Canuck Supply Co., remaining with this firm for three years. He resigned from this position to associate himself with the International Machinery and Supply Co., as general sales manager.

Manager (to late messenger): "You've been away over half an hour, and only to go round the corner!"

Messenger: "Please, sir, a man dropped half a crown in the gutter."

Manager: "And did it take half an hour to find it?"

Messenger: "Please, sir, I had to wait till the man went away."—Pearson's Weekly.

SCRAP METAL MARK ET MAY BE NOW

THE feeling is that the scrap market is on the eve of better days, although generally speaking, there is no improvement yet apparent. Following are reports from various U.S. points:—

St. Louis.—With a greater interest being shown in the market, some grades have advanced from 50 cents to $1.50 per ton. Steel scrap is in fair demand while cast iron is in good demand in small lots.

Boston.—It is generally expected that the next movement in the scrap market will be for the better, and that the present low level will not be reached again. Inquiries are very light, with some small sales of steel scrap reported. Heavy melting is at $11.50.

New York.—Scrap business is practically hung up in this district, and a good many people think that there is still some time to wait for an improvement. Dealers have their stocks pretty well down, and are able to wait for better days.

Pittsburgh. — Business is practically confined to the dealers, and prices are generally nominal. Heavy melting steel is quoted at $16 delivered, but it is thought that any appreciable activity in this grade would result in an advance. Machine shop turnings and cast iron borings are inactive.

Buffalo.—The market here is expecting something to happen almost any time. While there is almost no real business doing, the interest shown is keen, and a buying movement should develop very shortly.

Cleveland.—Most of the scrap is being held out of the market by yard interests, who are holding it for better prices. There is a scarcity of scrap due to low production, and a good portion of what is available has been thrown down by the yards. $20 steel in a few months is freely predicted by dealers.

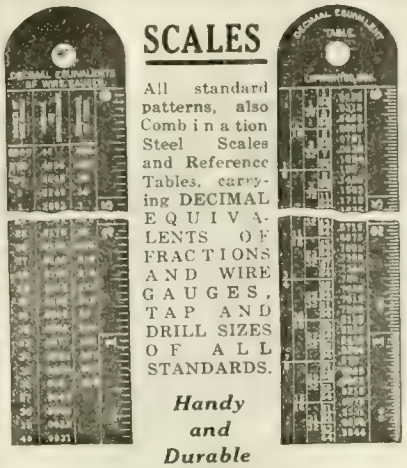
Chicago.—Dealers feeling that buyers must come out before very long, are quoting prices 50 cents to $1 per ton over last week's lists. Railroad offerings are bringing higher prices, and are freely offered, about 9,000 tons altogether, coming out this week.

Philadelphia.—Although scrap prices are low, consumers have a fair supply on hand, and have still some to receive on old contracts, so are not likely to buy. Government is asking for bids on shell forgings, plugs and billets. Machine shop turnings are quoted at $10.50 to $11.

Cincinnati.—Consumers evidently feeling that the bottom of the market has been reached, are more inclined to consider buying for future requirements. Feeling is generally better.

Birmingham.—There is no business reported, the tendency of both buyers and dealers being to wait. There has been some business in cast and heavy melting steel.

LUFKIN



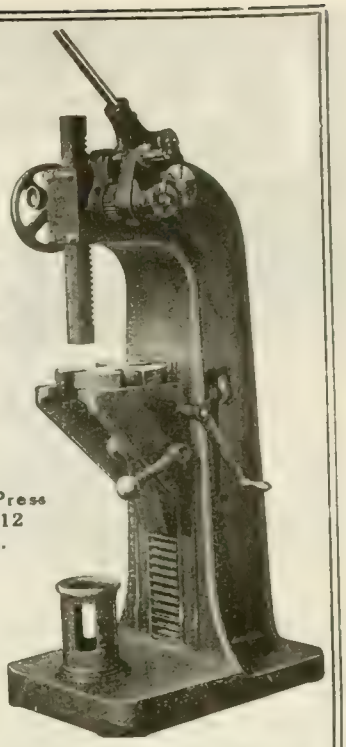
SCALES

All standard patterns, also Combination Steel Scales and Reference Tables, carrying DECIMAL EQUIVALENTS OF FRACTIONS AND WIRE GAUGES, TAP AND DRILL SIZES OF ALL STANDARDS.

Handy and Durable

THE LUFKIN RULE CO. OF CANADA, LTD.
WINDSOR, ONT.

3



No. 4 Press 10 to 12 tons.

Write for complete information on Atlas Arbor Presses. All sizes for all purposes.

ATLAS PRESS CO.
330 N. Park St.
Kalamazoo, Mich., U.S.A.

WOODLAND
Fire Bricks
And Other Grades
CUPOLA BLOCKS
FIRE CLAY

Prompt Shipment
From our Stock at
MONTREAL

We Solicit Your Inquiries

HARBISON-WALKER REFRACTORIES CO.
OF CANADA, LIMITED
Office and Warehouse:
301 ATWATER AVENUE
MONTREAL, QUE., CANADA

'Barnes-Made"
Springs
are unusual in service and wear.



They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857.

THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
BRANCH OFFICES: 50 East 42nd St., New York City; 618 Book Bldg., Detroit, Mich.
Manufrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

Clear
Wired and Frosted
Portlights

ROBERTS GLASS BEVELING CO. INC. RSG TRADE PORTLIGHT MARK LENS NEW YORK

PROMPT DELIVERIES

Canadian Representative:

John Lindsay

34 Victoria Street, Toronto

CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

POSITIONS WANTED

EXECUTIVE POSITION WANTED—DO YOU require a man to take charge of either your Purchasing or Accounting Department? One who has initiative, and is not afraid of hard work or responsibility. Have had seven years' experience on foundry and general machine shop work, four of which was on munitions. If interested apply to Box 604, Canadian Machinery.

WANTED—POSITION AS FOUNDRY FOREman, capable of fulfilling all duties required. Machinery or jobbing shop preferred. Excellent references. Reply Box 603, Canadian Machinery, Toronto.

AGENCIES WANTED

MANUFACTURERS' AGENT—CAN PRODUCE results. Open for any good line. Apply Box 578, Canadian Machinery. (c19m)

FOR SALE

ONE SECOND-HAND JENCKES CORLISS ENgine—12" x 30". Cut, description and price on application to Canadian Ingersoll-Rand Co., Limited, Toronto, Ont. (ctfm)

ONE 18" x 12' ENGINE LATHE, DOUBLE back geared, hollow spindle, bronze bearing, quick change gears, threading dial, compound rest, taper attachment, four jawed chuck, large and small face plates, steady rest and follower rest. Box 607, Canadian Machinery. (c23m)

REPRESENTATIVES WANTED

WANTED—BY A CRUCIBLE STEEL MANUfacturer in the United States a representative in Canada who is thoroughly familiar with the business in Carbon Tool Steels and principally High Speed Steel. State age, previous experience and salary wanted. Box 577, Canadian Machinery. (c21m)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

ZENITH FOR SERVICE
COAL
COKE

STEEL PRODUCTS OF ALL KINDS
LOW PHOSPHORUS PIG IRON

PROMPT DELIVERIES—SUBJECT TO INSPECTION.

Zenith Coal & Steel Products
Limited
402 McGill Building Montreal
1410 Royal Bank Bldg., Toronto, Ont.

WANTED

1—"Used" Plate Punch and Shear 36" gap, capacity 7/8" hole in 7/8" plate

—also—

1—"Used" Air Compressor, steam actuated—compound steam—simple air—12" x 12" cylinder.

Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

I. MATHESON & CO., LTD.
Builders of Machinery
New Glasgow, - Nova Scotia

For Sale

New and Slightly Used Machinery and Tools

1", 1½", 1⅝", 1¾", Turret Screw Machines.
No. 1, and No. 2 B.G. Automatic Tapping Machines.
⅜" 4-Spindle Acme Automatic Screw Machines.
Floor and Bench Drill—Presses.
Small Floor and Bench Punch Presses.
Burke Millers.
High Speed and Carbon Twist Drills.

Particulars on application to

ST. CATHARINES MACHINERY CO., LIMITED
ST. CATHARINES, - ONTARIO

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

Business Opportunities

A CANADIAN MANUFACTURER OF MAchinery for the use of contractors, miners, etc., is open to undertake the manufacture of any other machinery or device for the use of either contractors or miners, and invites correspondence with holders of Canadian patents, or with U.S. concerns desiring a Canadian manufacturing agency. Liberal inducements also offered for successful suggestions regarding machinery or other articles that can be manufactured and sold in connection with the above mentioned lines. Address Box 606, Canadian Machinery.

I HAVE A PATENT ON AN ELEVATING OR lifting truck and would like very much to make arrangements to organize a company in Canada to make and sell them, or to arrange with some firm to make and sell them on a royalty basis, or would consider an out and out sale. Address Box 608, Canadian Machinery. (c25m)

CANADIAN MACHINERY wants articles on shop practice, new devices, new ideas. We want stories of how repair jobs have been done and how you have developed new kinks to help your work along. CANADIAN MACHINERY pays for material of this nature and our contributors find it well worth their while.

PATENTS FOR SALE

Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

Allentown Experimental Works
Allentown, Pa., U.S.A.

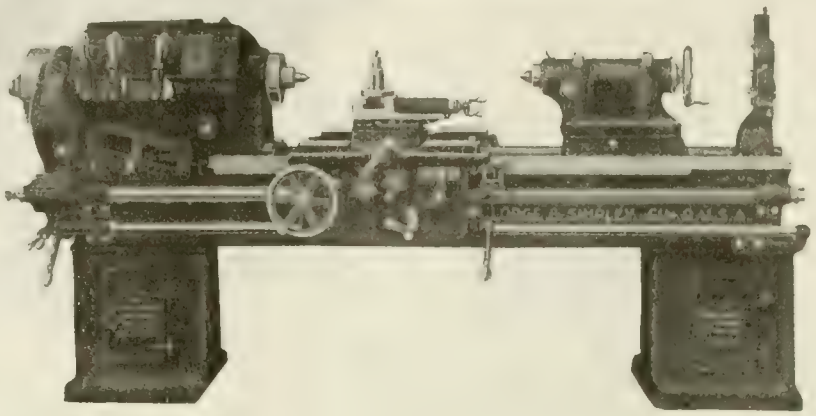
"Ask the Man Who Owns One"

Lodge and Shipley Lathes

Three Step Cone or Selective Gear Drive

DELIVERIES

14 Inch		*2 Weeks*
16	"	*—Stock*
18	"	*-2 Weeks*
20	"	*—Stock*
22	"	*June*
24	"	*Toronto stock*
27	"	*Toronto stock*
30	"	*2 Weeks*
36	"	*2 Weeks*
48	"	*3 Months*



Write for our new prices

Garlock-Walker Machinery Company, Limited

32 Front Street West

MONTREAL TORONTO WINNIPEG

"EVERYTHING IN METAL AND WOOD WORKING MACHINERY"

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY

Classified Advertising Section

143-153 University Avenue TORONTO, ONT.

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

In Stock for Immediate Delivery

Turbo-Generator Units	Boilers
Direct Connected Units	Smoke Stacks
Motor Generators	Tanks
Rotary Converters	Condensers
Transformers	Air Compressors

Separate Published Stock Lists for above apparatus. Staff of Engineering Specialists with three overhauling plants to SOLVE YOUR POWER PROBLEMS.

Buyers and Sellers of New and Used Machinery
Send us details of used plant for sale

MacGovern & Company, Inc.

285 Beaver Hall Hill - - Montreal

Offices: New York, Pittsburg, St. Louis.
Plants: Brooklyn, N.Y.; Lincoln, N.J., and Linden, N.J.

A Continent-Wide Service.

One Customer Says:

"We have the best Lathe in The City of Cleveland to-day"

READ THIS LETTER

B. & W. TOOL & DIE CO.
102 St. Clair Avenue, N.W.
Cleveland, Ohio, Nov. 19th, 1918.

Mulliner-Edlund Tool Co.,
Syracuse, N.Y.

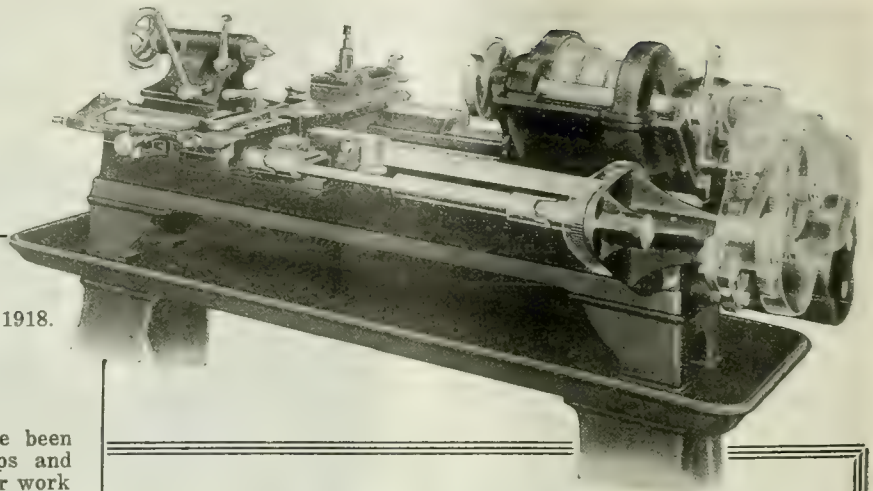
Gentlemen:—

Since installing your 12" Lathe, we have been practically running on Thread Gauges, Taps and Dies, since the 1st of June this year. All of our work has been subject to the Bureau of Standards Inspection, we have readings in our files which are open to inspection to anybody and in any of these readings, we do not find a greater lead error than .0003 in ten to twenty threads and in many cases, absolutely nothing. Our pitchers range from 12 to 40. We consider that we have the best lathe in the City of Cleveland to-day and this statement can be verified by the local Bureau of Standards.

We desire to thank you for the very courteous service furnished us through your Mr. Bull and we feel his personal attention has been instrumental in the successful service your lathe has given us.

With best wishes, we are,
Yours truly,
B. & W. TOOL & DIE CO.
By J. A. Walton

JAW/C"



This is the Kind of ACCURACY for Your Tool Room Work

Great Strength and Rigidity, too, Characterize the

MULLINER QUICK CHANGE LATHE

The quick change mechanism gives 37 different threads and feeds. Another feature is the ring self-oiling system. Sizes, 12-in., 14-in.; beds, 4-ft., 5-ft., 6-ft. **Send for the full details of this ideal precision tool.**

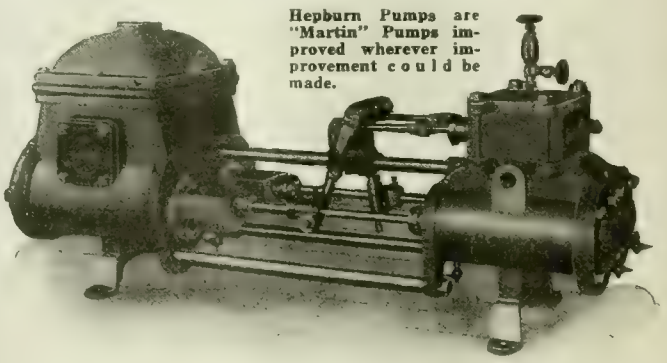
Mulliner-Enlund Tool Company
SYRACUSE, N.Y.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED
18-60 Van Horne Street Toronto, Ontario

Where Carborundum Products Go



THE GREAT
STUDEBAKER PLANT
SOUTH BEND, IND.

FOR generations the name Studebaker has been among the pre-eminent. Back in the days of the red-wheeled buggy and the dashing spring wagon Studebaker began growing.

And now in this age of the luxurious motor are heard not only the rumble of the wheels of Studebaker vehicles, but the throb of Studebaker motors in all quarters of the globe.

Back of the Studebaker products is a tremendously big organization and one of their great plants is at South Bend.

For the many and varied grinding operations in this plant they have learned to depend upon

Carborundum and Aloxite Grinding Wheels

Carborundum Wheels are grinding all of the grey iron automobile castings.

The carriage and buggy forgings are ground with Aloxite Wheels.

Aloxite Wheels are in the tool rooms grinding the tools and the dies.

Aloxite Wheels are in the woodworking departments gumming the big band and circular saws.

In the steel spring department Aloxite Wheels surface grind the springs after tempering.

And the Carborundum Service Department sees to it that Studebaker always get the right wheel in the right place—wheels that always cut clean and fast—that help to keep up production and uphold the Studebaker standards of workmanship.

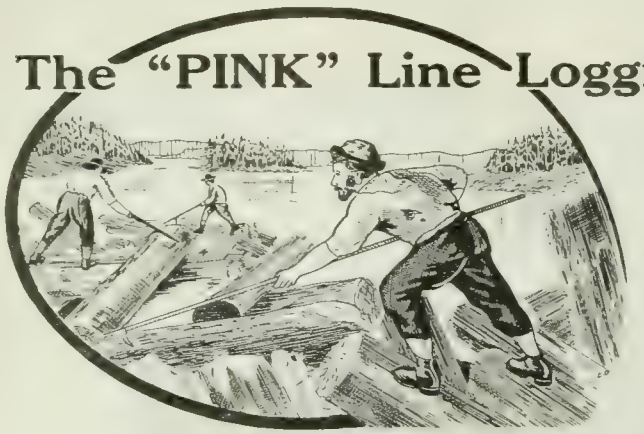
Carborundum Service can be of this same real service in your plant.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI PITTSBURGH
GRAND RAPIDS MILWAUKEE

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

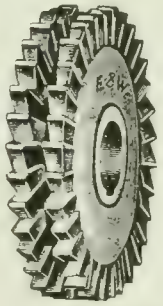
EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited
PEMBROKE, ONT., CANADA

Elliott & Whitehall Machine & Tool Co.
GALT, ONTARIO, CANADA

MILLING CUTTERS AND SMALL TOOLS



We manufacture the following tools, etc.

Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.

All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

ASK FOR OUR NEW CATALOGUE No. 10.

WELDING APPARATUS AND . . . SUPPLIES

The REGO 100% Efficient Welding Torch

Saves Oxygen Eliminates Flash-Back Better Welding

Write to us for anything and everything you need.

WELDING & SUPPLIES COMPANY
C. ROYER, Manager 1142 Ontario Street East, MONTREAL

TOOLS, DIES and GAUGES

Manufacturers of UNIVERSAL CYLINDER RE-BORING TOOLS.

Windsor Machine & Tool Works
Windsor, Ont.

SERVICE OUR SLOGAN

Prompt Delivery. Reliable Workmanship.

TRY US FOR

Centrifugal Pumps, Reciprocating Pumps for sand, water or wet shock.

Special Machinery of All Kinds.

PATTERNS CASTINGS FORGINGS

Submit us your problems. We would like to convince you.

VICTORIA FOUNDRY CO., LIMITED
OTTAWA - CANADA

SPECIAL MACHINERY

Built to Order

Also gauges, punches, jigs, dies, small tools, etc.
Prompt Service.
Moderate cost.
Send Blueprints for estimate.

MADE IN BRENCO CANADA

Brown Engineering Corporation
LIMITED, TORONTO
415-419 King St., W. Tel. Adel. 425

TOOLS & STAMPINGS

We have the equipment to make the tools and produce the stamping. Let us quote on your requirements.

PAT APPLD FOR

1-5 Lancaster St., Hamilton

DIAMOND TOOLS
FOR TRUEING GRINDING WHEELS

SERVICE QUALITY SATISFACTION
INDUSTRIAL GEMS

The GENERAL SUPPLY COMPANY of CANADA, Limited
OTTAWA TORONTO MONTREAL WINNIPEG VANCOUVER
356 Spark St. 38 Toronto St. 408 McGill Bldg. 85 Water St. 906 Vancouver Block
Sole Canadian Agents for
THE JOYCE-KOEBEL COMPANY, INC.
NEW YORK Formerly Geo. A. Joyce Co., Ltd. LONDON

This space, small though it is, is capable of producing big results if used continuously and judiciously.

Presswork

We take contract work—and turn it out quickly and accurately. We have facilities for:

Drawing
Piercing
Forming
Blanking

in all kinds of sheet metal. If you have any work of this kind let us quote you prices.

Henry Hope & Sons
of Canada, Limited
Peterborough



Steeled for Service

Steel in all its vital parts, gears, chains, hooks and guide, makes a Ford Tribloc durable and ready to meet the hardest lifting service you can give it.

The Tribloc works with high efficiency—eighty per cent. of the power applied to the hand chain is converted into lifting energy. An eighty-two pound pull of one man will lift a ton.

The Loop Hand Chain Guide, a patented improvement in chain hoist design, prevents "gagging" of the hand chain and injury to the block and makes a Tribloc safe, secure, reliable when working at any speed.

Ford Triblocs are made in all sizes from ¼ to 40 tons and are sold with a 5-year written guarantee.

Ford Chain Block & Mfg. Co.

Second and Diamond Sts., Philadelphia, Pa.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
120 BROADWAY, NEW YORK, U.S.A.

2152 D

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46
40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8. hole.

EMERY FLOUR AND WASHED FLOUR

EMERY GLASS FLINT GARNET CORUNDUM CARBORUNDUM	PAPER AND CLOTH	IN SHEETS, ROLLS, DISCS, BANDS, STRIPS and TAPES, &c.

John Oakey & Sons

LIMITED
WELLINGTON MILLS
LONDON, S. E. 1., ENGLAND

Philadelphia GEAR Works

VINE STREET PHILADELPHIA, PA.

Spur, Bevel, Spiral, Herringbone and Intermittent

GEARS and PINIONS

Made in all kinds of metals, rawhide and fibre

SOCKET WHEELS
MADE TO ORDER

DISTRIBUTORS OF
DIAMOND CHAINS

For Power Transmission, Machinery and Motor Trucks, Motor-Cycles and Bicycles.

We ship gears to all parts of Canada. Write us when you want good gears, good service, good prices.

Get our Catalogue: "All About Gears."



BEVEL
BEVELS

WRIGHT HOIST

Will Solve Your Lifting Problems



In mines, mills, foundries and industrial plants, on sugar plantations, in office and commercial buildings, on board ships, in fact, wherever there is lifting of any kind (up to 30 tons) to be done. Wright Hoists serve with that inimitable service which has made the name a synonym for satisfaction.

Let us tell you the cost of a Wright Hoist for your work and show you how it will save that cost many times over.

WRIGHT MANUFACTURING COMPANY

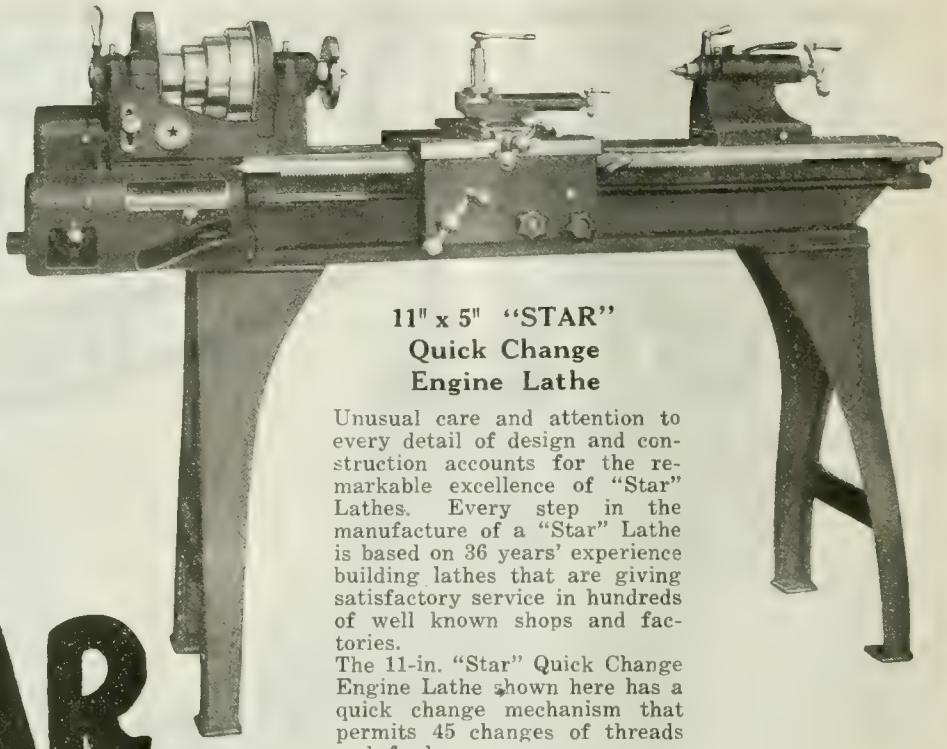
LISBON, OHIO

Canadian Distributors:
A. R. Williams Machinery Co., Ltd., Toronto
Williams & Wilson, Limited, Montreal

For Light, Accurate Commercial Work Experimental Shops Manual Training

You cannot find a more desirable Machine Tool than the—

STAR LATHE



11" x 5" "STAR" Quick Change Engine Lathe

Unusual care and attention to every detail of design and construction accounts for the remarkable excellence of "Star" Lathes. Every step in the manufacture of a "Star" Lathe is based on 36 years' experience building lathes that are giving satisfactory service in hundreds of well known shops and factories.

The 11-in. "Star" Quick Change Engine Lathe shown here has a quick change mechanism that permits 45 changes of threads and feeds.

Write for catalogue giving full particulars on our 9-in., 11-in., 12-in., and 13-in. swing sizes.

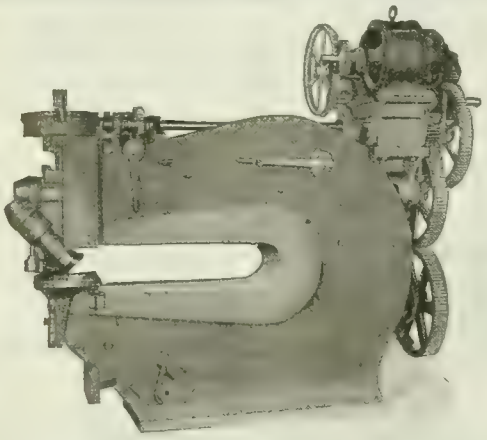
The Seneca Falls Mfg. Company, Inc.
366 W. Falls St., SENECA FALLS, N.Y.

H. COLLIER SMITH
"QUICKWORK"
Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

SPECIAL TOOLS

Automatic Machinery

for all purposes

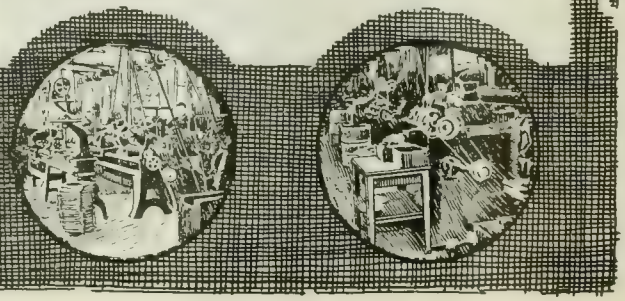
Punch Press Work

Screw Machine Products

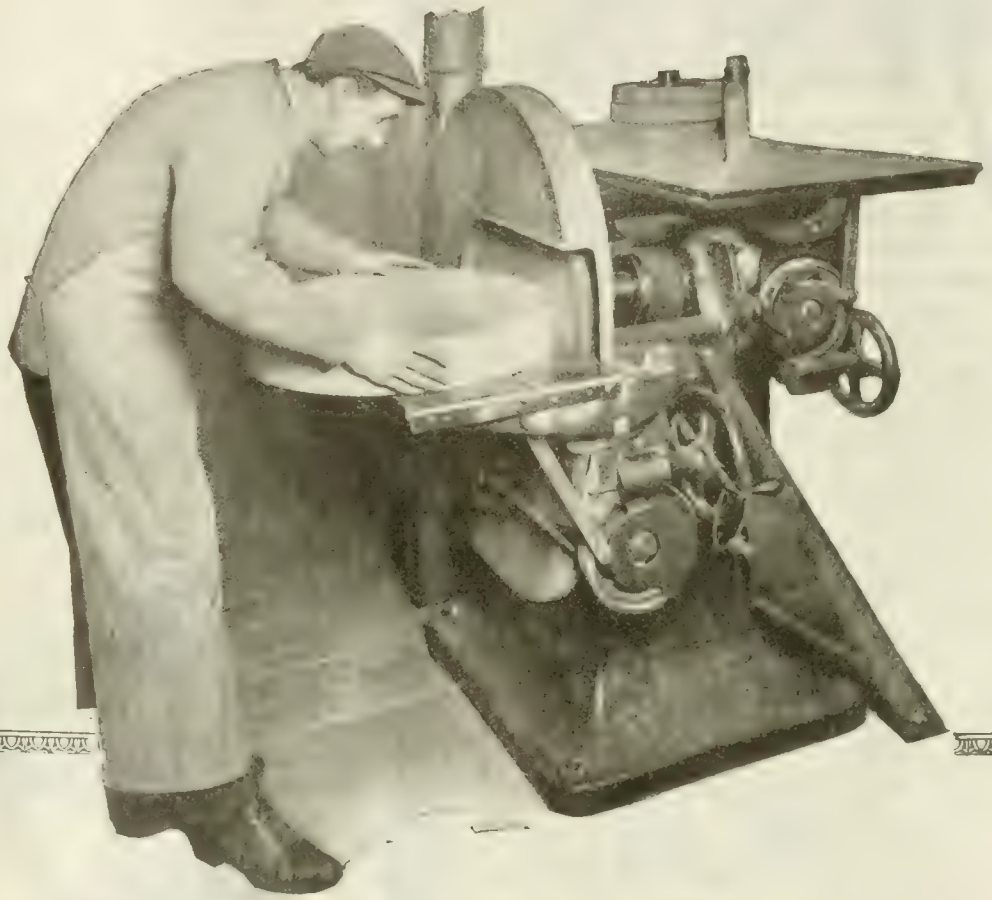
Consult us on your machine problems

Toronto Tool Company

516 Richmond St. West Phone Adel. 1181



"Oliver" Vertical Spindle and Disk Sanders



"Squaring the Circle"

It is impossible, mathematically, to reduce a square to the circular form.

Nevertheless, this No. 34 Sander, installed two years ago by the Standard Ship Building Corporation, has ground ventilator covers and other curved ship parts with mathematical precision.

In an Oliver Wood Working Machine what cannot be figured as a **process** may often be appreciated as a **result.**

Oliver Machinery Company

GRAND RAPIDS, MICH.

BRANCH OFFICES New York Salt Lake City St. Louis Los Angeles Phoenix Chicago San Francisco Manchester, England Paris, France

The largest selling quality pencil in the world

VENUS PENCILS

ENGINEERS and Architects buy VENUS pencils for themselves and for their staffs because the VENUS is always dependable in quality and grading. VENUS Pencil perfection means pencil accuracy, pencil efficiency and pencil economy.

17 black degrees and 3 copying

For bold heavy lines,
6B - 5B - 4B - 3B

For general writing and sketching, use
2B - B - HB - F - H

For clean fine lines,
2H - 3H - 4H - 5H - 6H

For delicate thin lines, maps, charts,
7H - 8H - 9H



Special 14c. Offer

Send 14 cents for three trial samples mentioning degrees. After you find how perfect VENUS Pencils are, buy them at any dealer.

American Lead Pencil Co.
238 Fifth Avenue, New York
and Clapton, London, England

"CANADIAN"

ACCURATE work demands accurate and efficient tools.

The Canadian No. 5 has some features worth considering.

Eight speeds, three power feeds—also hand and lever feeds.

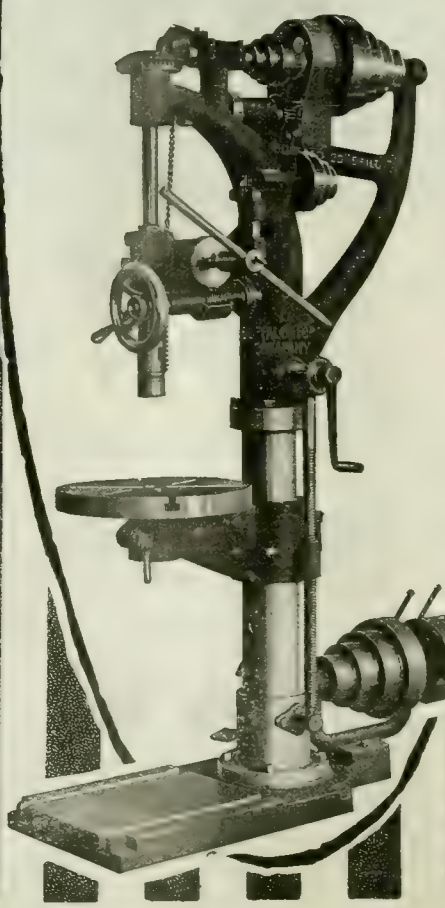
The twist of a knurled knob changes instantly plain drive to back geared drive—no tools to get lost or bother with.

An adjustable automatic trip throws out power feed when piece has been drilled to required depth.

Split adjustable bearings, ball bearing graduated spindle—but then there are so many features—for complete description write for literature.

Circular 1199-16 describes the whole Canadian Upright Series

Canadian Blower & Forge Co., Limited
Kitchener, Ontario



The Works behind the Label -



We never reach heights above our habitual thinking. It is the atmosphere we create for ourselves in thought that permeates and perfects what we do. The knowledge born of long experience that our product is the high speed steel par excellence fills the atmosphere of our plant with an ideal that every operative breathes. "Red Cut *is* the best and, therefore, it ***shall*** be the best" is the driving force that makes.

"Red Cut Superior"

THE NATIONALLY KNOWN—FIRST QUALITY

HIGH SPEED STEEL

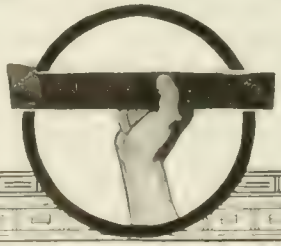
THE BEST FOR ALL MACHINE WORK

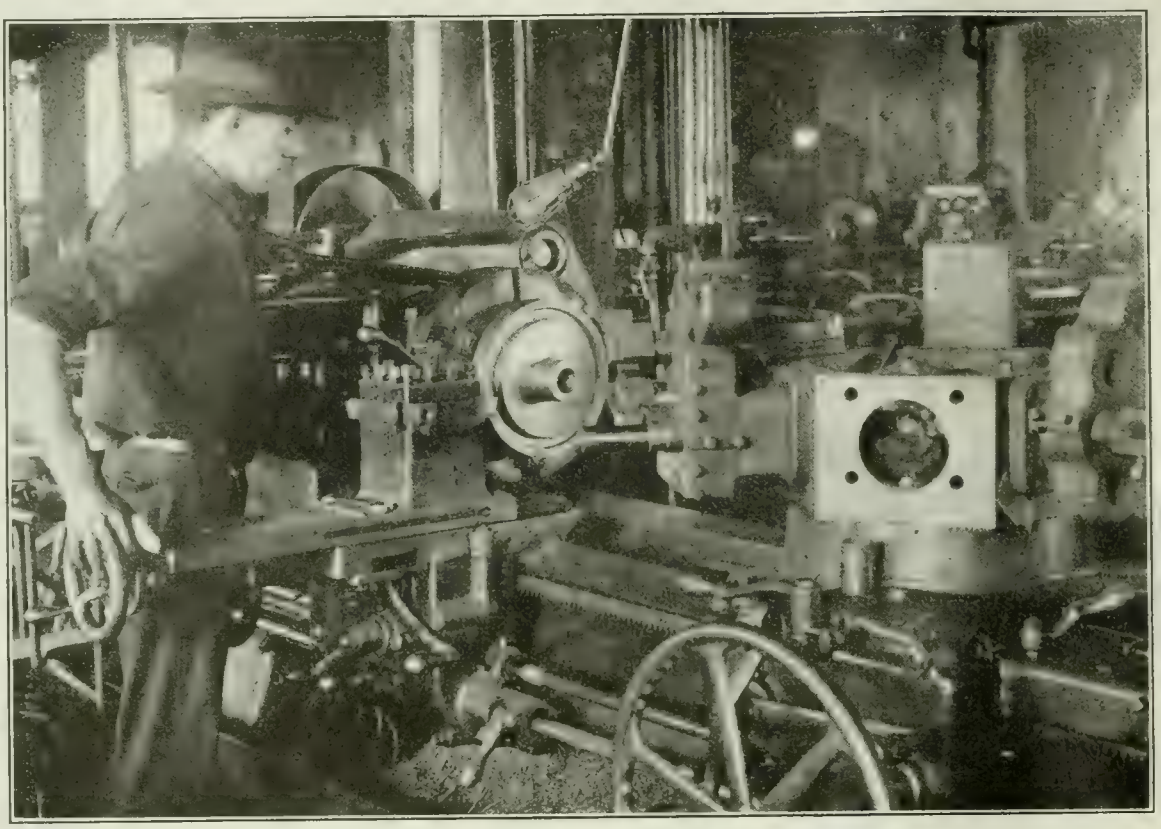
VANADIUM-ALLOYS STEEL CO.

General Sales Offices: Pittsburgh, Pa. Works: Latrobe, Pa.

BRANCH OFFICES:

BUFFALO, BOSTON, CLEVELAND, CHICAGO, CINCINNATI, DETROIT, NEW YORK, PHILADELPHIA, PITTSBURGH, TORONTO, MONTREAL





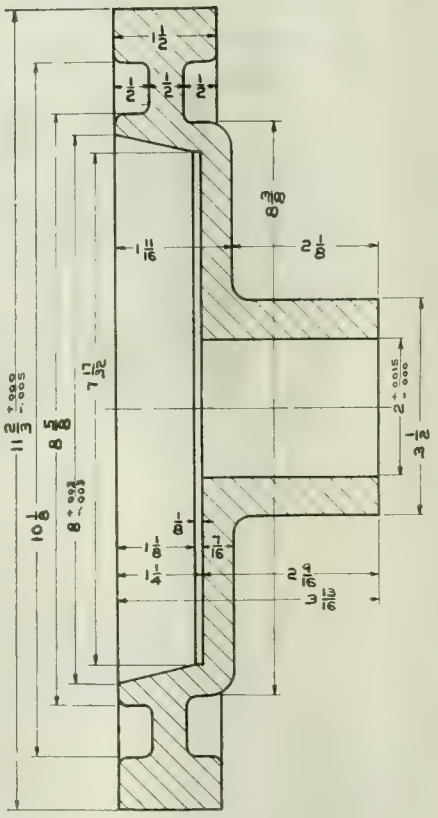
Universal Hollow Hexagon Turret Lathes

Rapid and accurate production is naturally expected when the Universal Hollow Hexagon Turret Lathe is installed for gear work. The carriage usually faces while the turret bores and turns both hub and rim.

Best for Gear Production

This cast iron friction gear blank is being finished on a No. 3-A Universal Hollow Hexagon Turret Lathe first because the accuracy possible on the machine is well within the limits specified, and second, the production of 13 per 10 hours is greater than had previously been possible on any other machinte tested. Being adapted to gear production up to 17 inches in diameter, bronze, cast iron, cast steel or forged steel, this machine has won great popularity with practically all the large gear producers.

Our Engineering Department is ready to tell you what this machine can do for you. Send us your blue prints.



2-A—Bar Capacity 2½" x 29" or 3¼" x 29"
Maximum Swing 16½".

3-A—Bar Capacity 3½" x 44" or 4½" x 44"
Maximum Swing 21½".

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U.S.A.

New York Office—Singer Building. Boston Office—Oliver Building. Buffalo Office—Iroquois Building.
Detroit Office—Ford Building. Chicago Office and Show Rooms—618-622 Washington Blvd.

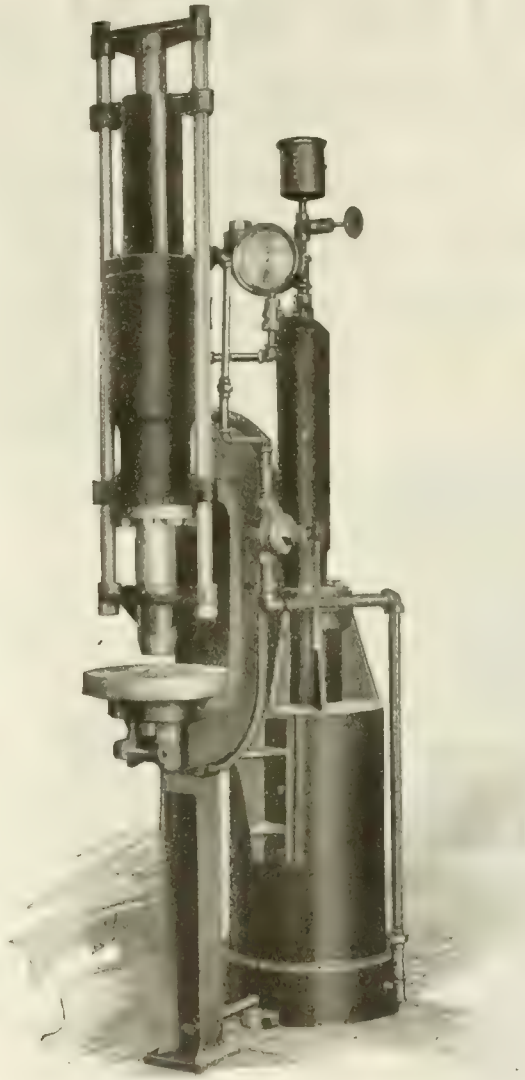
FOREIGN AGENTS: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow. Allied Machinery Company, Paris and Turin. Van Rietschoten & Houwens, Rotterdam. Yamatake & Co., Tokio. Benson Brothers, Sydney and Melbourne. A. Asher Smith, Sydney. A. R. Williams Machinery Co., Ltd., Toronto, St. John, Winnipeg and Vancouver. Williams & Wilson, Ltd., Montreal.

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

OXY-ACETYLENE

Thermit and Electric Welding

BY

THE CARTER WELDING CO.

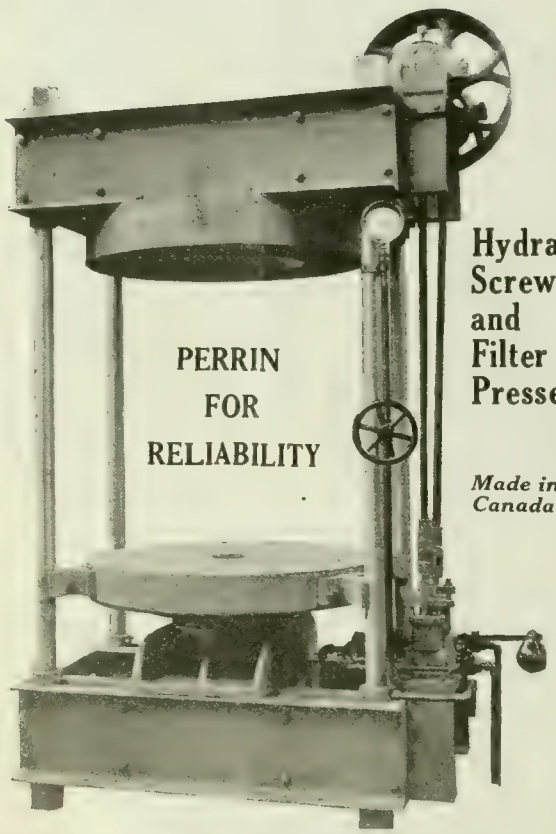
OF TORONTO, LIMITED

Oldest, Best Equipped, and Most Experienced
Welding Company in Canada

WRITE US ABOUT YOUR OXYGEN SUPPLY

TELEPHONES :
ADELAIDE 1524
ADELAIDE 2841

9-11 SHEPPARD STREET
TORONTO, ONT.



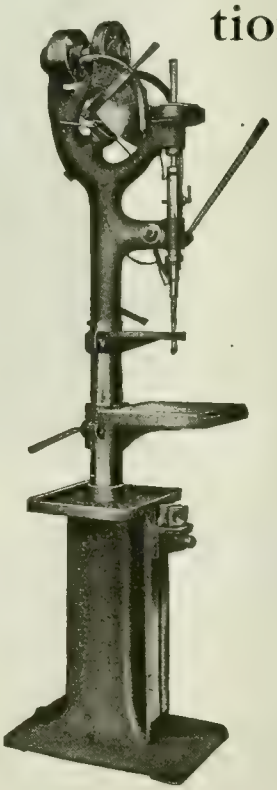
Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED
TORONTO

A Thorough Investigation Proves the "ALBANY" Drill Press



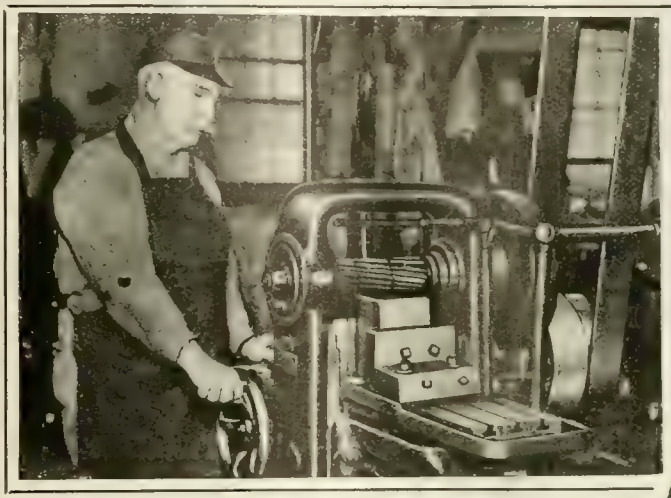
a well designed and constructed tool-room machine with many distinctive features. Among them: rapidity in changing speeds, drills and chucks, and in starting and stopping the spindle. An exceptionally good point is the micrometer depth gauge — which constantly registers the depth of the hole as it is drilled.

The greenest operator can't go wrong with the "Albany." All parts are fully guaranteed.

Details in Folder

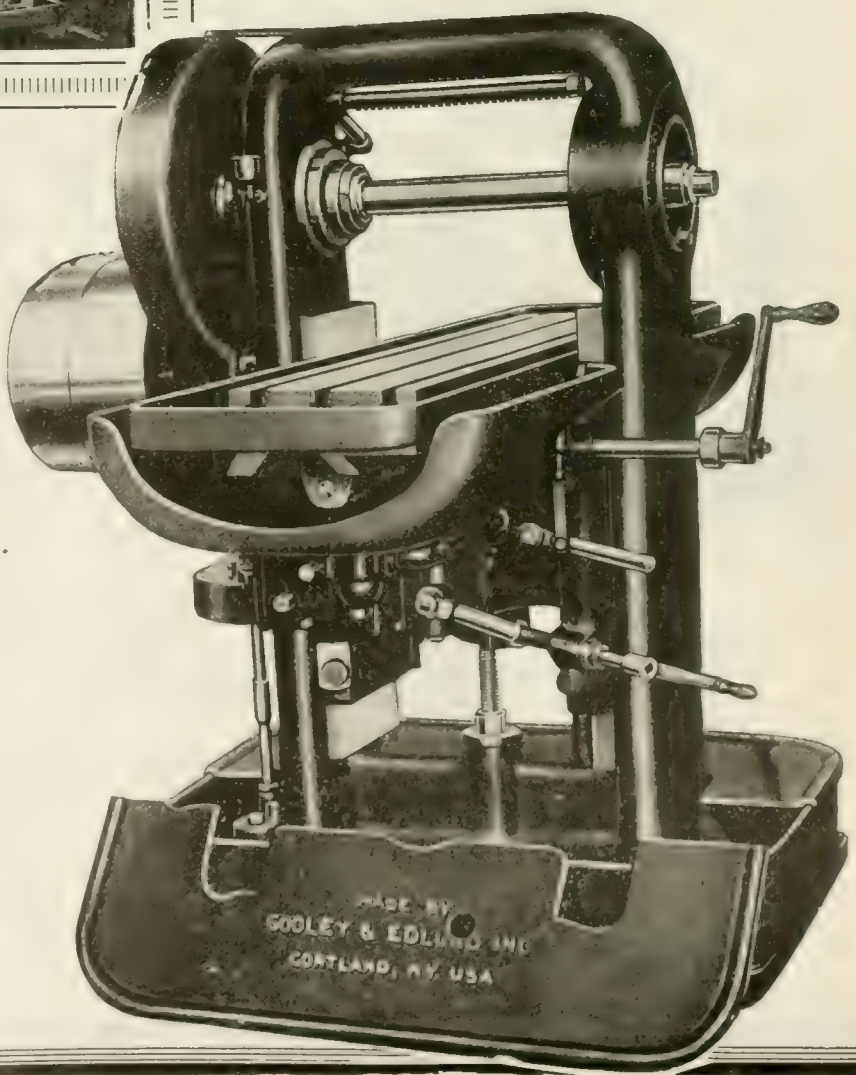
Albany Hardware Specialty Mfg. Co.
Albany, Winsconsin, U.S.A.

BRIGGS



MILLER

Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.

Gooley & Edlund, Inc.

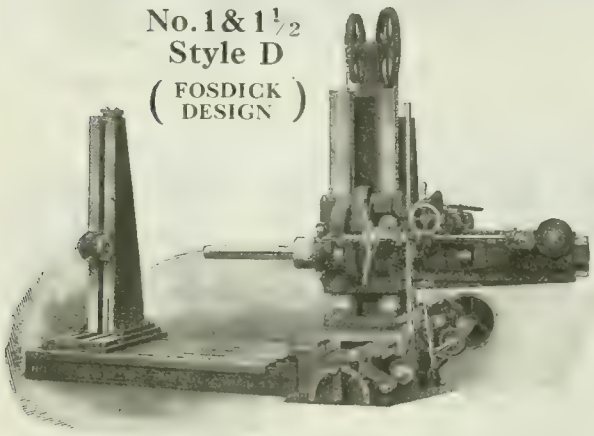
Cortland, N.Y., U.S.A.

Williams & Wilson, Ltd., Montreal

FOREIGN AGENTS: Allied Machinery Company of America, France, Belgium, Italy, Switzerland, Russia, Scandinavia and Barcelona; C. W. Burt & Griffiths & Co., London, Manchester and Glasgow; Andrews & George Co., Tokyo, Japan

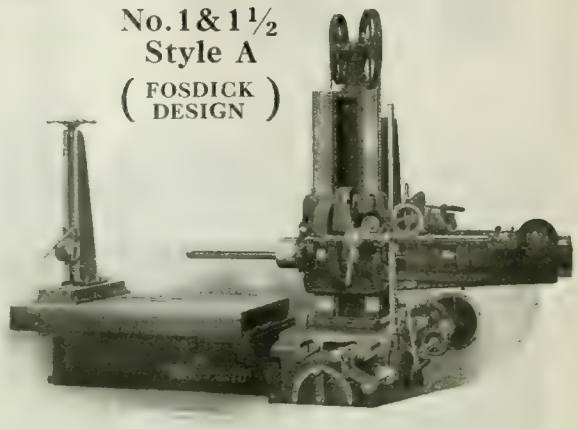
Boring, Drilling and Milling Machines

No. 1 & 1½ Style D (FOSDICK DESIGN)





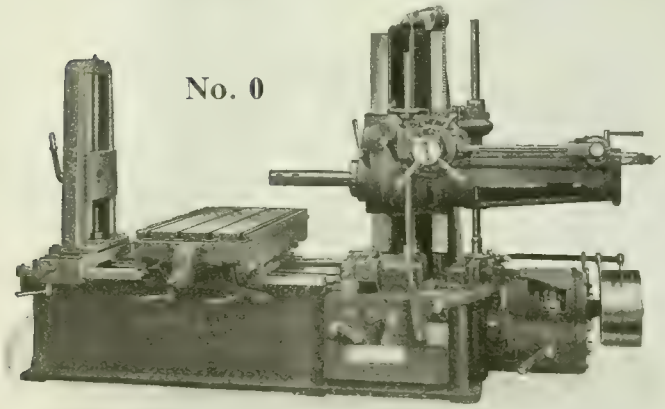
No. 1 & 1½ Style A (FOSDICK DESIGN)



SPECIFICATIONS:

Size of Machine	No. 1	No. 1½
Diameter of spindle	3½"	4"
Morse Taper No	5	6
Traverse of spindle	28"	30"
Vertical adjustment of head	36"	54"
Horizontal adjustment of column	36"	62"
Maximum, work bed to centre of spindle (Style A)	44"	62"
Maximum, work bed to centre of spindle (Style D)	58"	76"
Size of work bed	42" x 72"	42" x 120"

Size of Machine	No. 1	No. 1½
Speeds (1 to 255 R.P.M. geometrical progression)	12	12
Feeds, in all directions (.007 in. to ¼ in. per revolution)	8	8
Motor horse power	7½	10
Floor space	9' x 15'	11' x 19"
Total height of machine	8' 9"	10' 3"
Net weight (Style A machine)	16,000 lbs.	21,000 lbs.
Net weight (Style D machine)	15,000 lbs.	19,500 lbs.



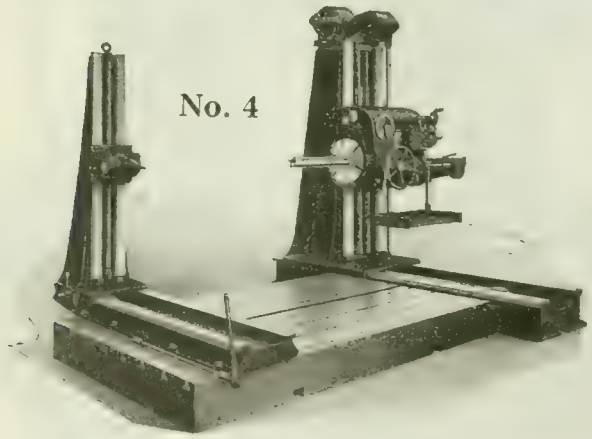
No. 0

Don't let the handling of those awkward, unwieldy pieces cause you trouble and keep down production and profit.

G. & L. Machines are the master of the situation.

Their convenience, simplicity, easy control and great accuracy will prove invaluable to your plant.

Let us put some interesting facts before you. Write for full particulars.



No. 4

NO. "4" FOR BIG WORK

Diameter of spindle	5
Size of hole in spindle	No. 6 Morse
Size of floor plate	8' x 12"
Floor space required	16' x 24' 6"
Weight	50,000 lbs.

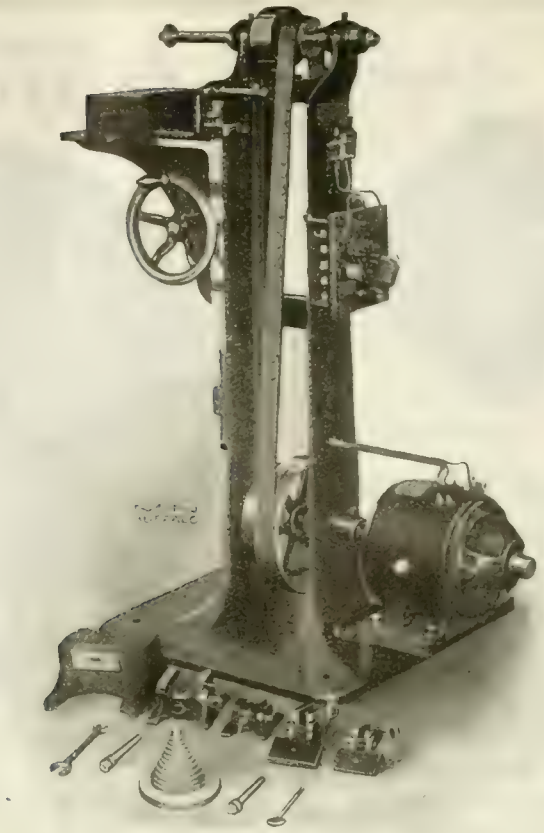
NO. "0" FOR PRECISION WORK

Diameter of spindle bar	3½ in.
Spindle bored to fit Morse Taper No.	5
Longitudinal travel of spindle	26 in.
Vertical adjustment of head on column	25½ in.
Size of table	24 in. x 50 in.
Traverse travel of table	30 in.
Longitudinal travel of table	32 in.
Approximate net weight	9,500 lbs.

Drop us a line for detailed information and catalogue.

Giddings & Lewis Manufacturing Company
Fond Du Lac, Wis.

FOREIGN AGENTS:—Canadian Fairbanks-Morse Co., Toronto, Montreal, Winnipeg, Vancouver; Fenwick, Freres & Co., Paris, Lyons, Liege, Zurich; Burton-Griffiths & Co., England; Wynmalen & Hausmann, Rotterdam; R. L. Scrutton & Co., Limited, Sydney, Australia; Rylander & Asplund, Stockholm; Wilh. Sonesson & Co., Malmo; Gustav Nielsen, Christiania.



The "MODERN" Die Chaser Grinder

Let Your Die Troubles End Right Here

Why let Die Trouble stand between you and maximum production?
In the

Modern Die Chaser Grinder

you will have a machine that does away with die trouble—because its output is **marvellously eccentric.**

Made for belt drive or a complete motor-driven unit. Special attachments for grinding Spring Dies, Pipe Dies, Reamers, Taps, Hobs, Spiral and End Mills, Milling Cutters, etc.; can be furnished with the regular equipment.

For Fast Accurate Work

Bulletin C. G. will give you full details. We would also be pleased to send you full particulars re **"Modern" Self-Contained Grinding Machines.** Tools splendidly adapted to meet the present demand for large production.

Modern Tool Company

Main Office and Works: State and Peach Streets, Erie, Pa., U.S.A

Canadian Agents: Rudel Machinery Co., Toronto and Montreal

New York Office: - 50 Church Street
Chicago Office: - 32 N. Clinton Street

F. Wesley Parker, Resident Engineer and Export Agent, 2 Rector Street

CLEANLINESS CAPACITY



EFFICIENCY DURABILITY

A Time Tried and Proven Economy Bearing Primarily Built for Line Shafting

THE ESTEEM in which CHAPMAN DOUBLE BALL BEARINGS are held is born of a certain and intimate knowledge of their superiority in actual service and power saving ability, an estimation which is highest among over 4,000 plants using them.

A Few of the Many Well Known Plants Using Chapman Double Ball Bearings

Pierce-Arrow Motor Car Co.	Buffalo, N.Y.
Bethlehem Steel Co.	South Bethlehem, Pa.
Ford Motor Co.	Walkerville, Ont.
International Harvester Co.	Hamilton, Ont.
Goodyear Tire & Rubber Co.	Bowmanville, Ont.
Canadian Rand Co.	Sherbrooke, Que.

Chapman Double Ball Bearings are built so as to fit any hanger frame.
They reduce power costs 15% to 40%.
They are entirely drip proof.
They are dust and dirt proof.
Require lubrication once a year.
They increase production.

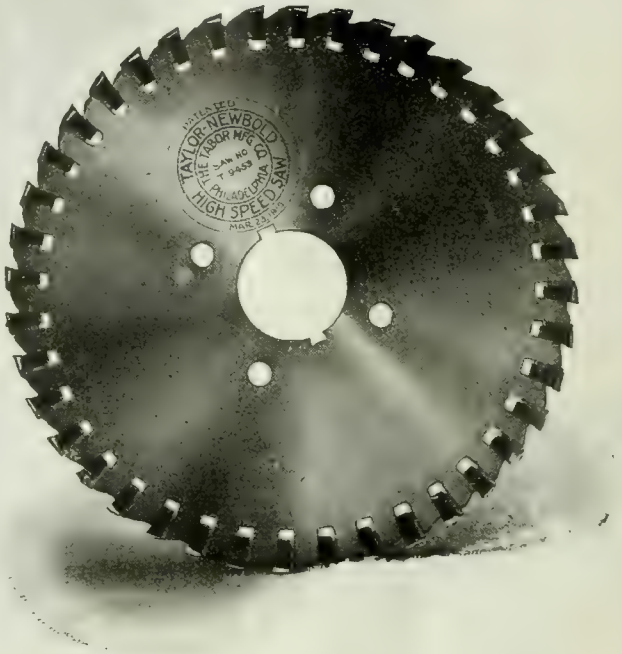
Send for Catalog No. 3-B and Proof

The Chapman Double Ball Bearing Co., Limited

339 Sorauren Ave., Toronto, Canada
408 Shaughnessy Bldg., Montreal, Que.

The Transmission Ball Bearing Co., Inc.
1050 Military Road, Buffalo, N.Y.
New York, Cleveland, Chicago, Philadelphia, Cambridge, Mass.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

The Hammer With The Human Stroke



HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the **High Speed Riveting Hammer** does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
ROCHESTER, N.Y.

TRANSVEYORS
Did It!



Castings by the hundreds—yes, by thousands—all easily, rapidly and efficiently transferable with the Transveyor.

Not on the floor, but on wooden platforms, or, as illustrated, on skids made instantly mobile by elevating the Transveyor under the loaded skid—that is Transveyor transfer.

Despatching and storing material the Transveyor Way, promotes system, saves time and labor through the elimination of rehandling; reduces "overhead" cost.

Any business with a floor under it can beneficially apply Transveyors. Our latest machinery bulletin is yours for the asking. To what address shall we send it?

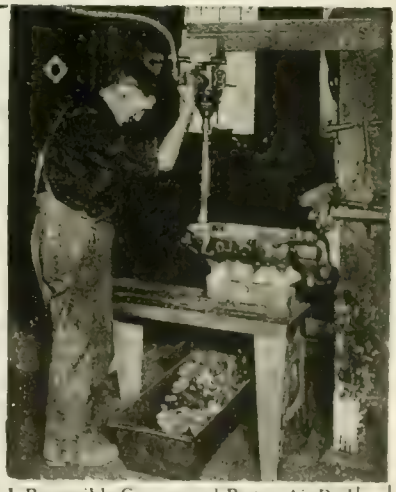


COWAN TRUCK COMPANY
15 Water Street, HOLYOKE, MASS.
Canadian Agent:
R. B. SMILEY
120 Glenholme Ave., Toronto, Ontario, Canada

Thor

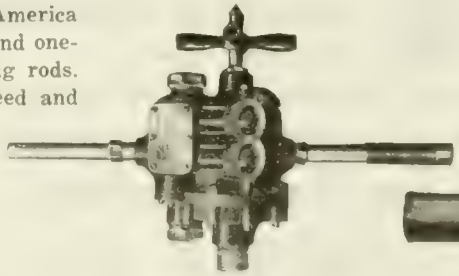
Pneumatic DRILLS and Hammers

There is a Thor Tool made especially for your work. Try it—and watch it save you time and labor and increase your production.

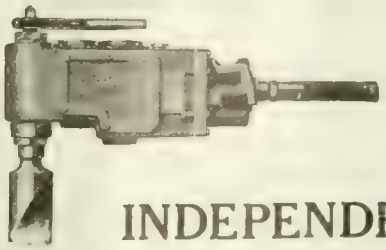


No. 32-L Reversible Compound Piston Air Drill driving 3-8 inch studs in Motor Crank cases.

Thor are the only air drills made in America having Corliss valves, roller bearings, and one-piece pressed Vanadium steel connecting rods. Also equipped with telescopic screw-feed and removable crank chamber plate.







Twenty years of knowing how built into each Thor Tool you buy.

For full particulars write—

INDEPENDENT PNEUMATIC TOOL COMPANY
334 St. James St., Montreal, Que.
Toronto : 32 Front St. W. Winnipeg : 123 Bannatyne Ave. E. Vancouver : 1142 Homer St.

Cuts Costs Increases Production ---it is a Rockford Machine

This powerful machine is made to drive high-speed drills up to 3″ diameter, for drilling and boring tools up to 8″ in diameter, for boring out cored holes in cast iron.

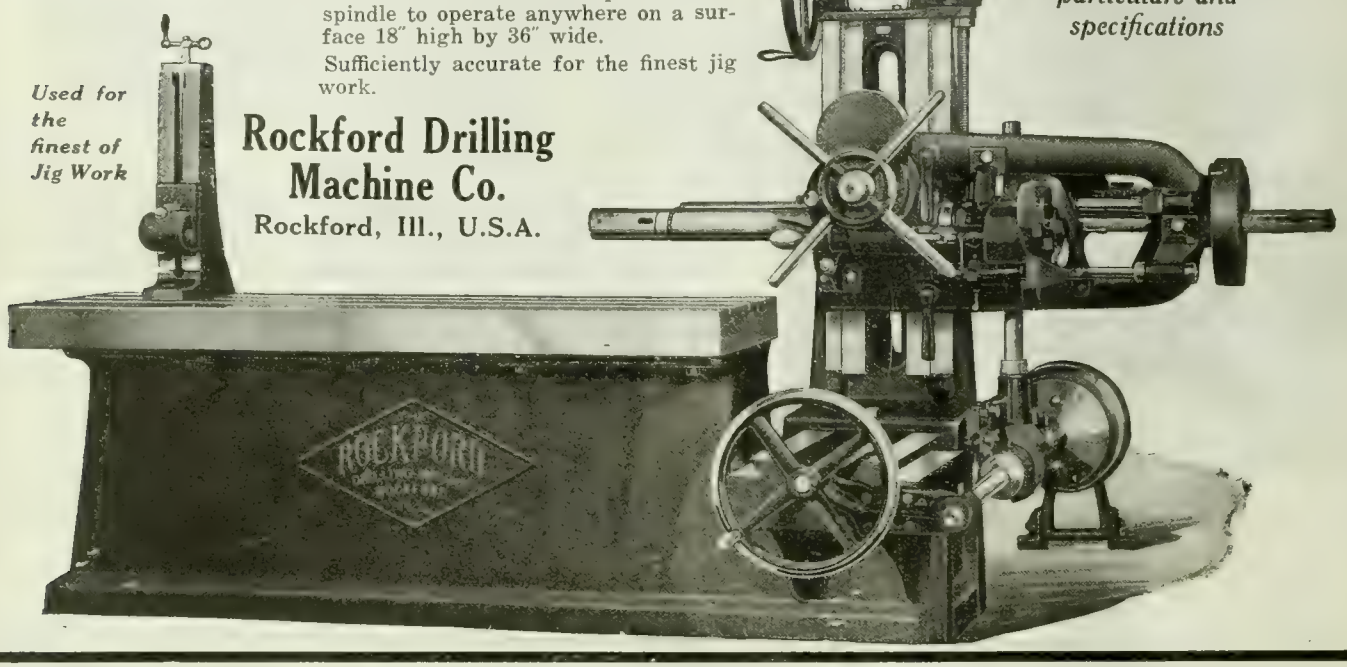
It has a lateral and vertical adjustment of the head that permits the spindle to operate anywhere on a surface 18″ high by 36″ wide.

Sufficiently accurate for the finest jig work.

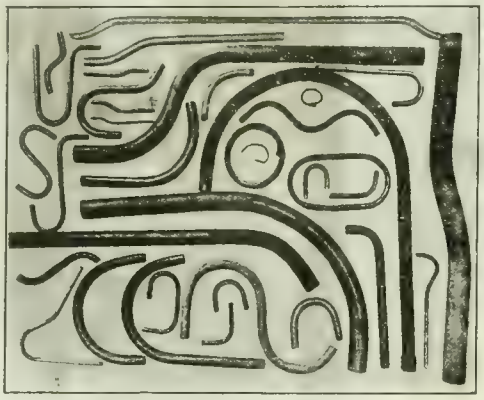
Investigate now.

Write us for full particulars and specifications

Used for the finest of Jig Work



Rockford Drilling Machine Co.
Rockford, Ill., U.S.A.



POWER -- BENDERS

THREE NEW MODELS

"Wonder" Pipe Bending Machines (pat.)

Electrically operated to bend from 1/8″ to 20″. Send for printed matter. We also manufacture TEN other sizes, hand operated benders.

American Pipe Bending Machine Company
52 Pearl Street **Boston, Mass., U.S.A.**

THE

TRADE K–T IE MARK

FOUNDRY
GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

—ASK US

Oxy-Acetylene Welding and Cutting



Cutting 3/8 inch Sheet Steel Piling (including lock joints 2 1/4 inches thick) by the Prest-O-Lite Process.

One Man Does the Work of Two In Less Time, At Less Cost

This illustration shows one man, with a Prest-O-Lite blow-pipe, cutting 3/8-inch sheet steel piling, used in the construction of the protection piers of a large drawbridge. This one man handled the entire job, cutting an average of seven feet of piling per hour—an enormous saving over the old slow and costly method of sawing, which required the services of two men.

Prest-O-Lite PROCESS

offers splendid opportunities for substantial savings in manufacturing, construction and repair work.

Prest-O-Lite Oxy-Acetylene welding and cutting is opening the way to construction and repair operations which cannot be performed by any other process.

Employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders, for emty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the process quickly and easily. There is practically no line of metal manufacturing or repairing in which oxy-acetylene welding has not already established itself firmly as standard routine method.

Write for valuable illustrated literature and data on work others are doing by Prest-O-Lite welding process. It may point out ways to solve your problems.

Address Dept C-197

Prest-O-Lite Company of Canada, Limited

PREST-O-LITE BUILDING
Corner Elm St. and Centre Ave.
TORONTO

Plants at: Toronto, Ont., Merritton, Ont. Shawinigan Falls, P.Q. St. Boniface, Man.



World's Largest Makers of Dissolved Acetylene



Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

ANGULAR GRIT

Saves Labor
Saves Time
Saves Costs

Quicker and Better



One ton of Angular Grit equal carloads of sand

ANGULAR GRIT offers you the most advanced and economical method of cleaning castings, etc. Its angular and irregular cutting points clean raw castings and forgings more thoroughly and with greater speed than either sand or shot.

ANGULAR GRIT dispenses with sand bins and sand dryers, and there is no dust nuisance where it is used.

If you are using sand, think of the labor you can save by adopting ANGULAR GRIT in its place.

Used for all kinds of cleaning operations —best materials for cleaning shells. Prove its superiority by giving it a trial.

Pittsburgh Crushed Steel Co.

Established 1888

Pittsburgh, Pa., U.S.A.

Canadian Representatives:

Williams and Wilson Ltd., Montreal, P.Q.

Dull Files, Dull Workmen

You cannot get the best out of men working with dull tools

The personal satisfaction they get out of working with sharp, well balanced tools makes for contentment.

It is better to throw away a dull file and buy a new one than to "economize" by keeping the dull file in use.

"Famous Five" Files give maximum returns because the steel in them is accurately cut and properly hardened.

Order them. They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

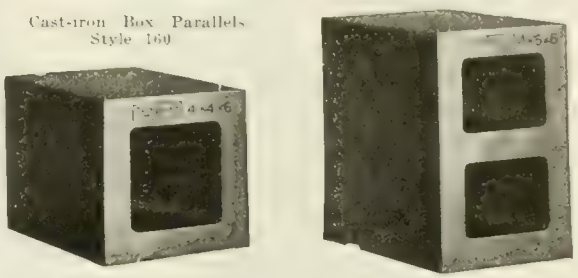


Standard Gages, Parallels, Angle Irons V Blocks, Etc., Carried in Stock

"Specials" Designed and Made by our Specialists

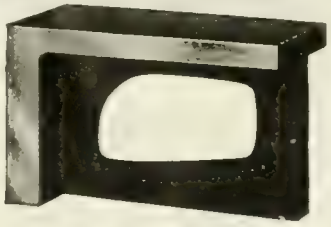
The Taft-Pierce line of standardized tool room accessories is comprehensive—includes a wide variety of close limit equipment necessary for tool room operation—and saves time and trouble all along the line.

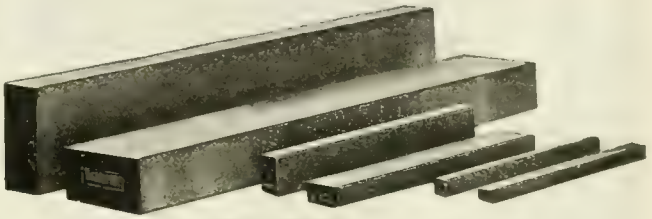
Cast-iron Box Parallels Style 160





Universal Right-angle Irons Style





Steel Parallels Style 150





Single-end Internal Limit Gages

Besides regular equipment — Standard Gages, Parallels, Angle Irons, V Blocks, etc., we have standardized certain "specials," designated by our tool specialists, notably Taft-Peirce Plug Gages—a flexible system of handles with interchangeable gages in all sizes from 1/4 to 3 inches.

We carry these tools in stock and can make shipments promptly on most orders. Exactly duplications on re-orders assured. Ask for Catalogue 104-E.



Adjustable External Limit Gage Style

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

NEW YORK, Woolworth Building DETROIT, Majestic Building

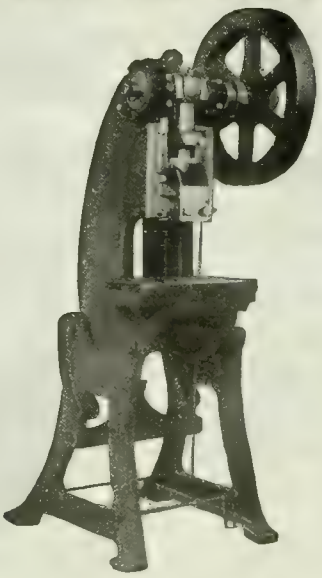
WILLIAMS & WILSON, LIMITED

MONTREAL AND QUEBEC

CONSOLIDATED

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

CONSOLIDATED POWER PRESSES



CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN

U. S. A.

CONSOLIDATED

For trimming, stamping forging, punching, embossing.

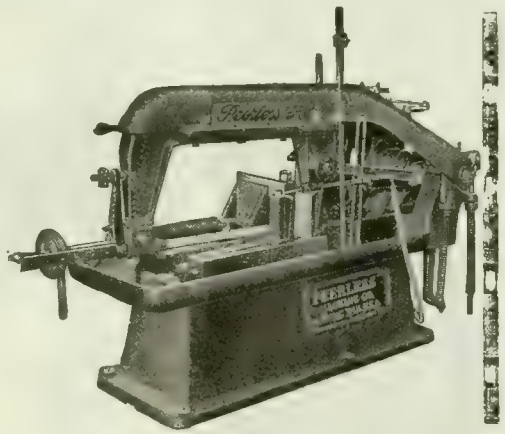
Special presses are designed where the customer's requirements are unusual.

CONSOLIDATED POWER PRESSES

Peerless HIGH SPEED

The New Standard of Production

Why Not Cut Off Stock From 50 to 100% Faster?



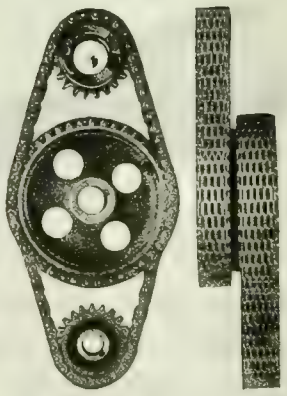
Is there any reason why you should not profit by the superior speed, accuracy and capacity of the Peerless, as well as others? Why you should not do more work with the same number of machines, or the same work with fewer machines? Why you, also, should not save in room, in operating expense and in costly material?

We will prove to you what the Peerless is doing in some of the largest plants in the country, or will let you prove its superiority in your own plant. A machine is ready for you to try, and if after 30 days' use you want to let it go, you may ship it back at our cost for freight both ways.

Write us about it—now.

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN



War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-17 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

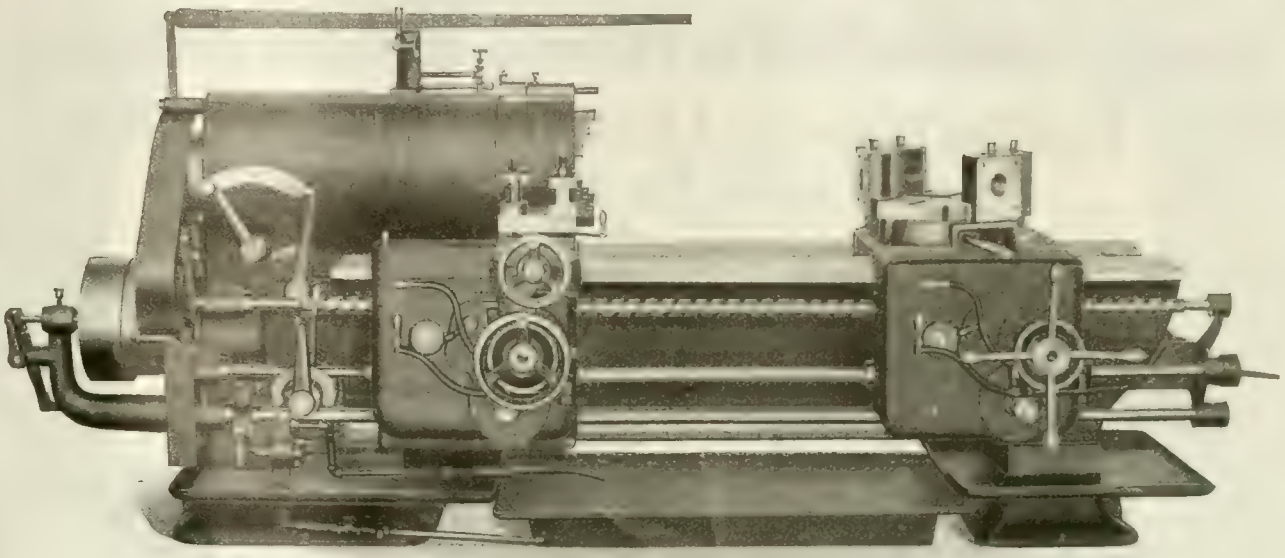
One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

STEINLE



Another reason why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

The Massive High Powered
Quick Change Speed Headstock

The headstock housing is cast integral with the bed, this design insuring rigidity and permanence of alignment. This headstock is of box section entirely closed on front, top and bottom and also on the back with the exception of an opening left for assembling purposes and for which a suitable cover is provided. This design and the distribution of metal are arranged with a view of securing rigidity and also with the idea of absorbing all vibration due to heavy wide faced cuts and shock or jar incidental to intermittent or uneven cuts, all of which it successfully accomplishes. The thirty spindle speeds are substantially divided into three groups as follows:

First train of gearing: 10 spindle speeds corresponding to open belt speeds.

Second train of gearing: 10 spindle speeds corresponding to back gear speeds.

Third train of gearing: 10 spindle speeds corresponding to face gear or triple gear ratio. In reality the first train is back geared; the second double back geared; and the third quadruple geared. All of these gear ratios are high, resulting in great leverage in the application of power to the spindle. The amount of power consumed in transmission is small, almost negligible in fact, with the result that the machine can be operated at very low power cost, the same amount of power being delivered to the spindle at all speeds but varying in the amount of torque according to the different gear ratios, the amount of torque increasing with the corresponding decrease in spindle speed.

All gear ratios and speed changes are controlled by conveniently located levers.

There are more good reasons why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work. We will give these reasons in future advertisements in this journal. Watch for them. They will be interesting to you.

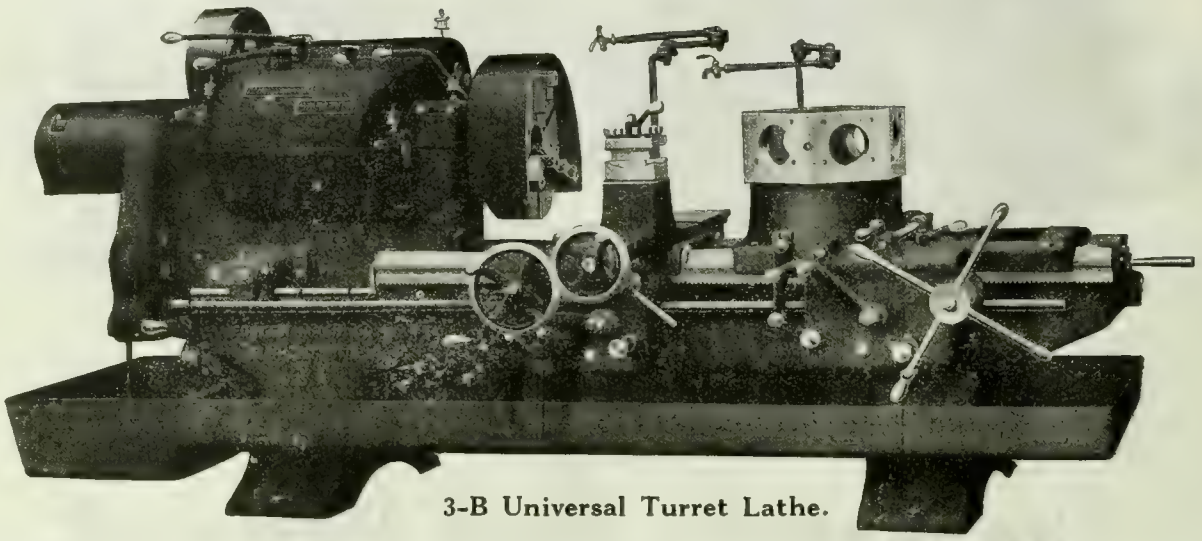
STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

ANNOUNCEMENT

Another Addition To The Foster Line Makes Its Debut

A Very Rigid Test Proves The 3-B UNIVERSAL TURRET LATHE An Easy Leader For Heavy Work.



3-B Universal Turret Lathe.

THE FOSTER LINE

No. 1-B UNIVERSAL TURRET LATHE
Bar Cap. 2" — Swing over Carriage, 14" over Cross Slide, 8"

No. 2-B UNIVERSAL TURRET LATHE
Bar Cap. 3 1/4" — Swing over Carriage, 20" over Cross Slide, 13 1/2"

No. 3-B UNIVERSAL TURRET LATHE
Bar Cap. 4 1/2" — Swing over Carriage, 26" over Cross Slide, 18 3/4"

No. 0 PLAIN HEAD SCREW MACHINE
Bar Cap. 5/8" — 10" Swing

No. 1 PLAIN HEAD SCREW MACHINE
Bar Cap. 1" — 11" Swing

No. 2 PLAIN AND FRICTION HEAD SCREW MACHINES
Bar Cap. 1 1/8" — 13" Swing

No. 3 PLAIN, FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1 3/4" — 14 3/8" Swing

No. 4 FRICTION HEAD SCREW MACHINE
Bar Cap. 1 7/8" — 17 1/4" Swing

No. 5 FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1 7/8" — 17 1/4" Swing

Nos. 6, 7, 8, 9, 10 FRICTION HEAD SCREW MACHINES
Bar Cap. 2 7/16", 2 1/2", 2 15/16", 2 1/2", 3 1/2" resp. — 20" Swing

No. 2 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1 1/2" — 14" Swing

No. 2 FRICTION SET OVER TURRET LATHE
Bar Cap. 1 7/8" — 14" Swing

No. 3 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1 7/8" — 16" Swing

No. 3 FRICTION HEAD SET OVER TURRET LATHE
Bar Cap. 1 1/2" — 16" Swing

THREAD MILLERS
Manufactured under the Holden & Morgan Patents

The 3-B Universal Turret Lathe, the most recent addition to the large Foster line of Screw Machines and Turret Lathes, is similar in design throughout to the now well-known 2-B Universal Turret Lathe. The only fundamental point of difference between the two machines being that of size. The machine is of the combination type and is capable of handling bar and chucking work up to its capacity with equal efficiency. The bar capacity through the automatic chuck is 4½" and the bore of the spindle 5⅛". For chucking work the machine is regularly equipped with an 18" three-jaw scroll chuck. The swing over the cross-slide is 18¾" and over carriage 26". The efficient turning length of the hexagon turret is 40".

Rigidity has been the watchword throughout in designing this machine. The carriage bridges across the ways of the bed. The bed itself is made of heavy box construction.

The driving pulley is capable of receiving from the belt up to 12 H.P. This power is transmitted through a large diameter friction clutch and three nests of sliding gears to the spindle. The 12 speed changes, ranging from 8 to 218 R.P.M., are instantly obtainable by means of the shifter levers mounted on top of the head.

One of the many strong points, of special value on a large size machine, is the location of the feed changes in the aprons of the two tool-carrying units. These changes are instantly obtainable and no time is wasted by walking to the end of the machine to change the feed. The feed changes are 12 in number and range from .0055" to .150" for the longitudinal feeds and from .0029" to .080" for the cross-feeds.

This is only touching a few of the high spots of the many strong features of this machine.

Watch this space in the future issues for further particulars, or write for our 3-B catalogue.

FOSTER MACHINE CO., Elkhart, Ind.

PUNCH PRESS WORK

What Can You Save?

By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.
370-386 PAPE AVE., TORONTO.

MARTEN

MACHINE CO. HAMILTON, ONT.

ACCURACY-RELIABILITY

AUTOMATIC TOOL

MACHINES, EQUIPMENT APPLIANCES and TOOLS
for
SPECIAL PURPOSES
DESIGNED AND BUILT

We will make what YOU want as you want it.

Write us about it.

WOOD PATTERNS METAL PATTERNS Hand and Machine

OUR REGULAR PRODUCTS:
THREAD GAUGES
SNAP GAUGES
CYLINDRICAL GAUGES

WE ARE GENERAL AND SPECIAL TOOL MAKERS

Let us quote you on your requirements, and have your tools made as you want them made.

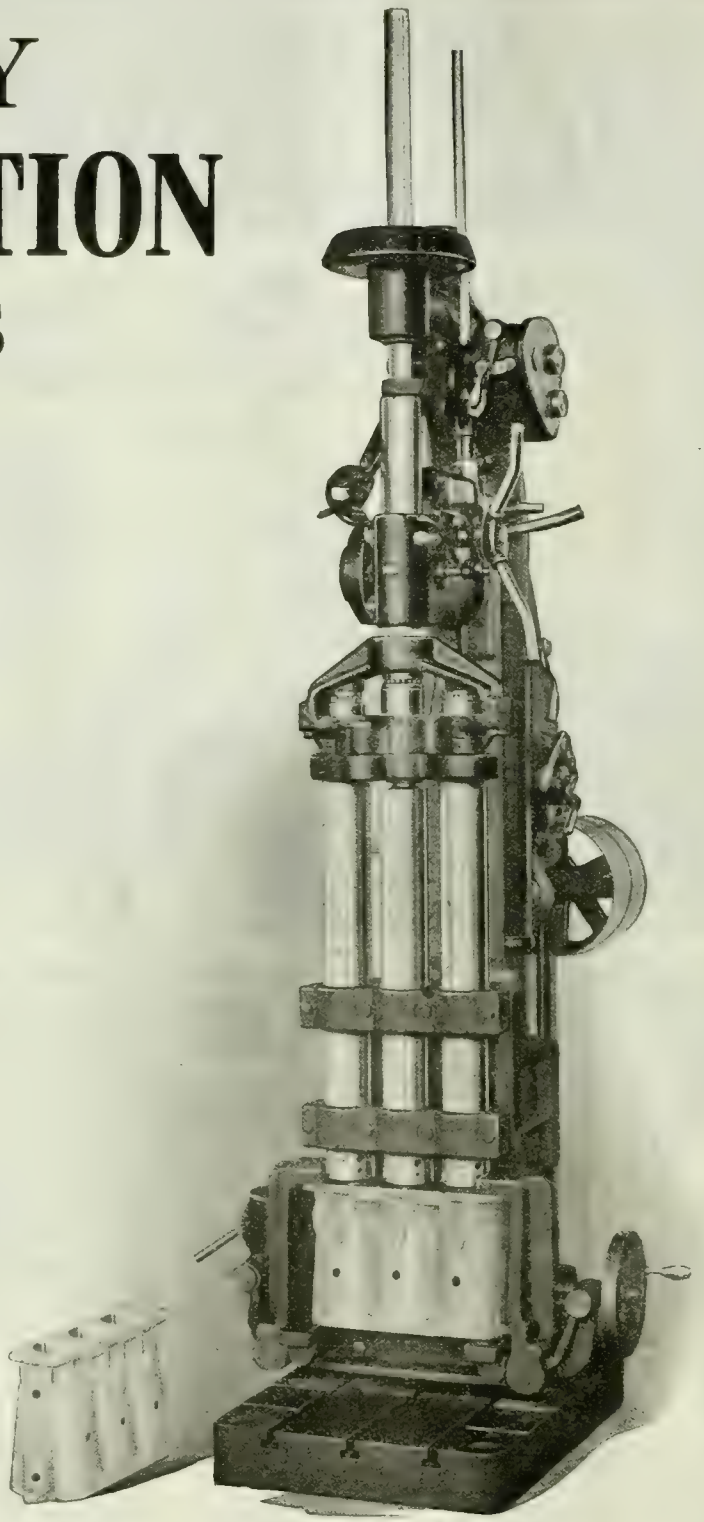
WOOD PATTERNS METAL PATTERNS Hand and Machine

KELLY PRODUCTION TOOLS

The cut shows a 26-in. Barnes Sliding Head All Geared Drill equipped with Kelly Multiple Cylinder Tools.

Kelly Combination semi-finishing and finishing tools suitably piloted with hardened and ground "STRIP" pilots machine the three cylinder block to ACCURATE SIZE and FINISH.

ADJUSTABLE and REPLACEABLE high speed steel or stellite blades make the UPKEEP cost on Kelly Tools a minor item.



DELIVERIES 1-10 DAYS

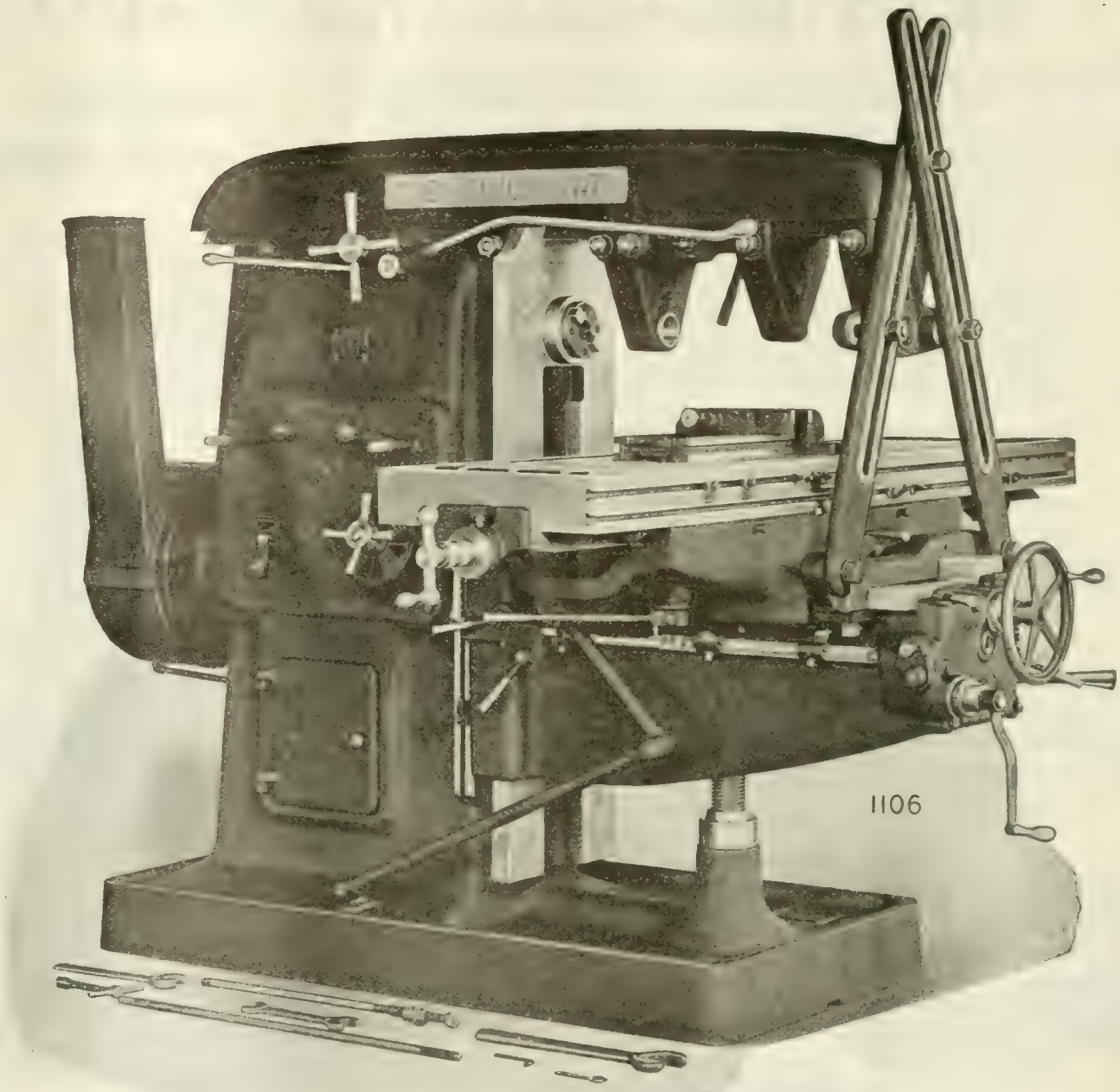
Send for our Catalog J-4

The Kelly Reamer Company
CLEVELAND, OHIO, U.S.A.

AGENTS:

Western Can: Canadian Fairbanks-Morse Co., Winnipeg. London: Burton, Griffiths & Co., Ltd.
Paris: Burton Fils Latin America: Fox Bros. & Co., New York City
Stockholm: G. A. Galco, Ltd. 40 Domestic Agencies

An Entirely New Miller



"The Cincinnati No. 5"

Sixteen Big Productive Features

Intermittent Feed with Power Quick Traverse, Rectangular Overarm, Square Gibbed Narrow Guides, Feed Changes made in Front of Machine, Individual Feed Control Levers at Front of Machine. Individual Feed Control Levers at Side of Machine for Control from behind the Table. Automatic Lubrication, for Mechanism in Column. Centralized Oiling for other Mechanism, six Stations. Stream Lubrication for Cutters and Work, Sliding Gears for Speed and Feed Changes, Safety Coupling for both Feed and Quick Traverse, Main Starting Lever, Controlled from Front or Rear, Automatic Brake for Spindle Stop, Cincinnati Flanged Spindle End, No. 14 Taper Hole in Spindle for large Arbors, Spindle Reverse in Machine.

The Cincinnati Milling Machine Company

CINCINNATI, OHIO

Canadian Agents:

H. W. Petrie, Ltd. - - - Toronto, Ont.
Taylor Engineering Co., Ltd - Vancouver, B.C.
H. W. Petrie, of Montreal, Ltd., Montreal, Que.
General Supply Co., of Canada - Winnipeg, Man.

Here's Information You Need!

In view of the modern trend toward welding as a means of labor, time and money saving, and the positive superiority of ***ARMCO IRON*** filling material, every well posted welding engineer should have this book of valuable information at hand for quick reference.

Send for your copy

"Armco Iron Welding Rods and Wire" is not merely a catalog, but treats in a helpful way of the following subjects:

Requisites of a desirable filling material.

Welding of mild steel and wrought iron.

How and why the new American product ARMCO IRON surpasses the now unobtainable genuine Norway and Swedish irons as a welding material.

How a single composition of ARMCO IRON supplants a large number of compositions of other welding materials.

Analysis and physical tests of ARMCO IRON.

Typical examples and illustrations of welding done with ARMCO IRON.

Emergency Fleet Corporation specifications for welding wire.

Microscopic study of steel and iron with reference to welding.

Cost cards for keeping tab on welding jobs.

Metallurgy of iron and steel, including color chart for heat treatment.

Miscellaneous useful data including tables of wire gauges, conversion of temperatures from Fahrenheit to Centigrade, properties of elements and metal compositions, decimal equivalents, metric conversion tables, definitions of electrical units, mensuration factors.

If you are a consulting, designing or managing engineer, shop superintendent or foreman, your free copy is ready for mailing on request, and the engineering advice of our welding specialists is also free for the asking.





PAGE STEEL & WIRE CO.

Established 1883 as Page Woven Wire Fence Co.

Makers of "Copperweld" Copper Clad Steel Wire; ARMCO Iron Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for all Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stockroom Partitions; Architectural Iron.

Plants: Monessen, Pa. and Adrian, Mich.

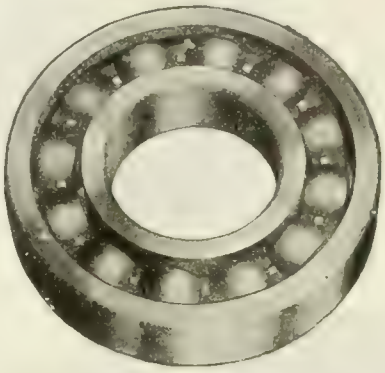
Sales Offices: 30 Church Street, New York

Western Representatives: Steel Sales Corporation, Chicago

36

BALL BEARINGS
and AUTOMOBILE PARTS

All standard sizes, annular and thrust bearings. Shipped from stock. Quotations on special bearings given promptly.



Automobile parts, heavy and difficult steel stampings—also heat treatment and grinding of steel a specialty.

All Sizes of Steel Balls Shipped From Stock

The Gray Ball Bearing Company, Limited

686-692 St. Clarens Avenue TORONTO, Canada

Castings-Forgings

A FEW days lost in striving to ascertain where certain steel products can be obtained means money and prestige sacrificed—and a set-back to your policy of prompt delivery.

CUT delays to the minimum, and assure yourself of systematic co-operation by placing your orders for FORGINGS AND CASTINGS with us.

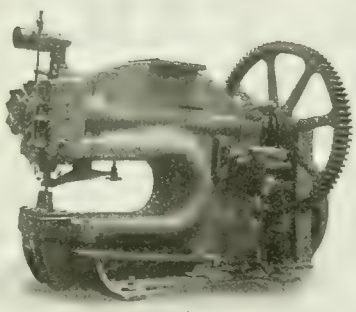
OUR equipment is as complete as a Foundries Equipment could be, our service organization Dominion-wide in scope, ever on the alert to give you practical, efficient service.

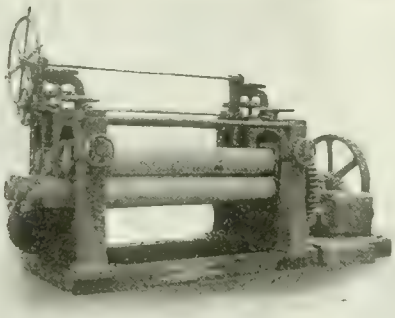
NO matter what your requirements be, we can supply you promptly. If service and quality count with you—we will eventually receive your enquiries.

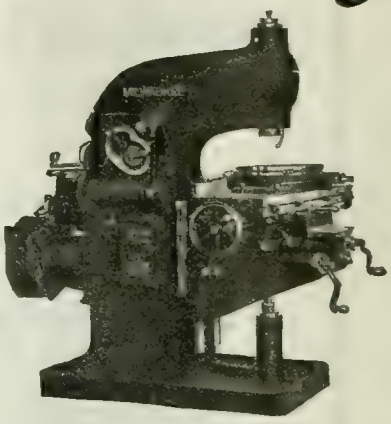
DOMINION FOUNDRIES & STEEL, LIMITED

HAMILTON, CANADA

Where the Best in Machinery









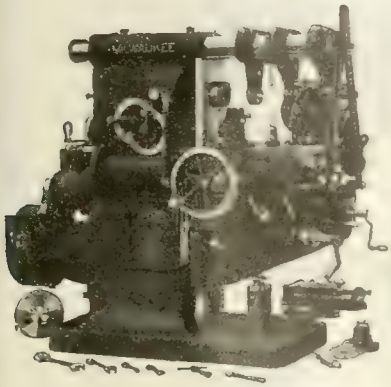
MACHINERY
WILLIAMS & WILSON
LIMITED
MONTREAL

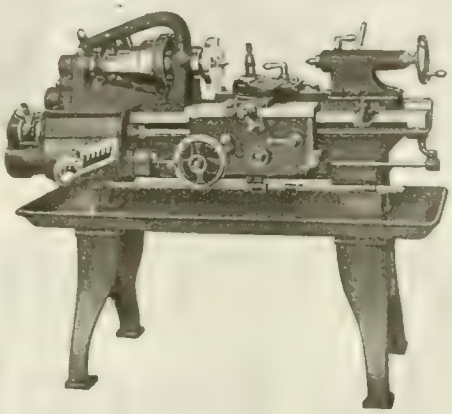
WILLIAMS &

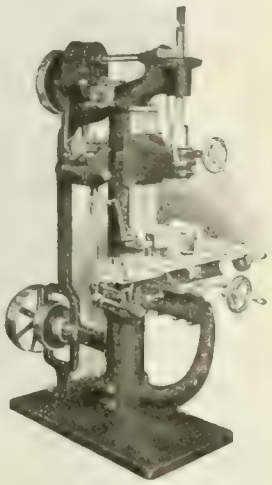
Cable Address
"Willwills"

Montre

meets the Best in Service



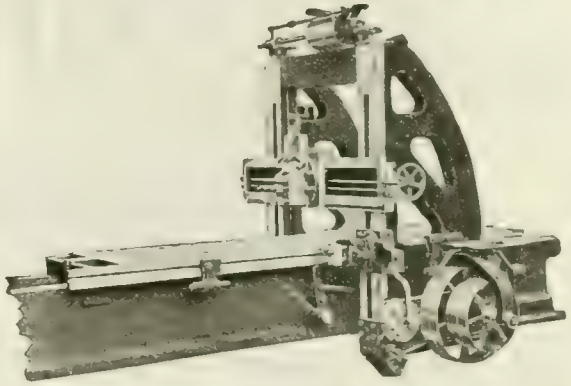




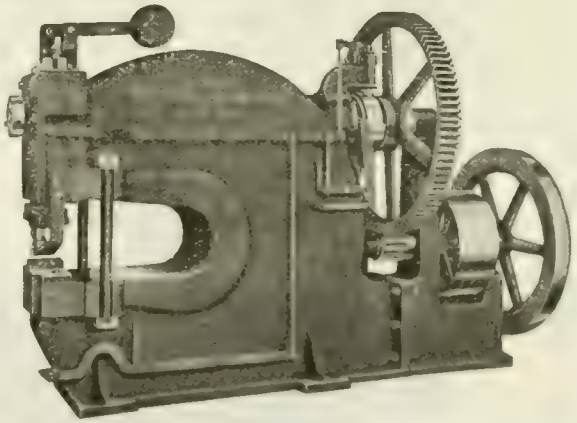
Now In Our New Building

84 INSPECTOR STREET
MONTREAL

with a complete line of High Grade Tools



Write us about any tool or tools in which you are interested and we'll gladly quote prices and deliveries.



PROMPT SERVICE

Absolute Satisfaction Guaranteed

NILSON LIMITED
Established 1891
1 P. Q.

MACHINERY
WILLIAMS & WILSON
LIMITED
MONTREAL



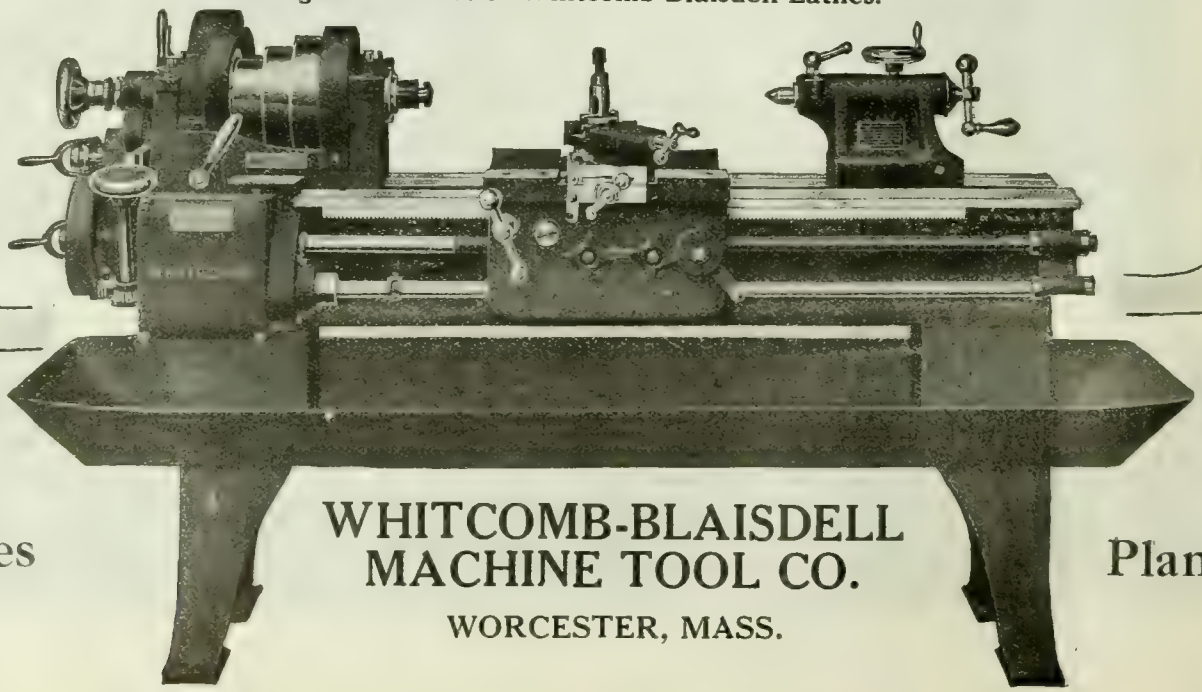
Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product.

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes.



Lathes

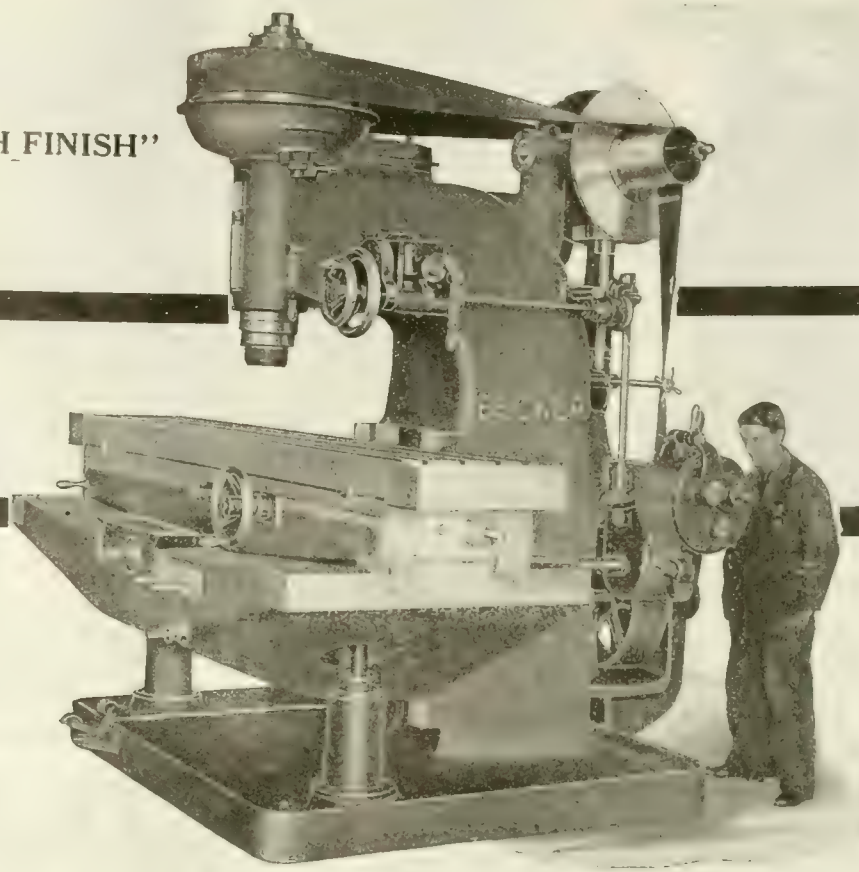
WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Planers

MASSIVE — POWERFUL — ACCURATE

"THE MACHINE
THAT GIVES
THE SMOOTH FINISH"



BECKER MODEL D1 MILLER

Especially designed for heavy work where absolute accuracy is a necessity. The powerful knee, operating on twin elevating screws controlled by a single operating handle, or lever, if power feed is desired, keeps the work rigid and well supported even when working at the extreme traverse. Its wide surface offers a range that is exceptional even for a "BECKER."

The work is held permanently aligned with the spindle by means of the Patented Becker Gibbing which distributes the strain along the entire bearing surface of the column instead of concentrating it at one or two points.

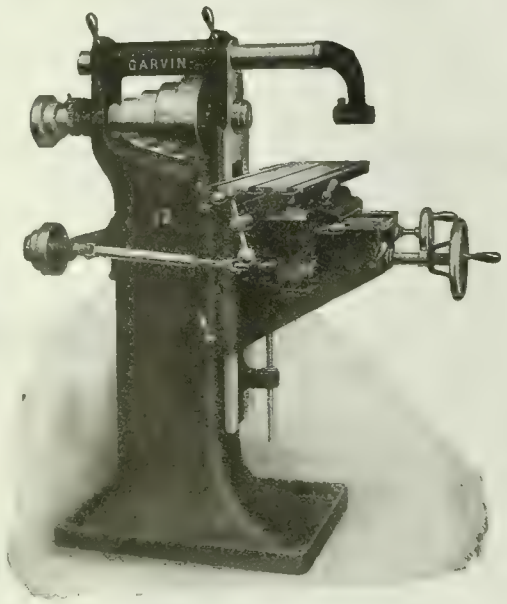
Circular 0-601 describes the Model D-1 in detail—Write for it NOW.

BECKER MILLING MACHINE COMPANY

DETROIT HYDE PARK, BOSTON, MASS. INDIANAPOLIS

Rudd-Belnap Machinery Company, Limited, 137 McGill St., Montreal, Que.
A. R. Williams Machinery Company, Limited, 64 Front St. W., Toronto, Ont.

GARVIN



No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments 18 x 6 x 15 in.

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

Every Emery Wheel With Its Own Dresser



Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"**—the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

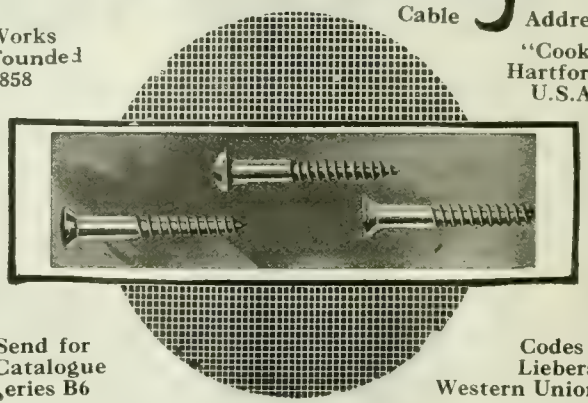
The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Wood Screw Making Machinery

Works Founded 1858

Cable Address "Cook" Hartford, U.S.A.

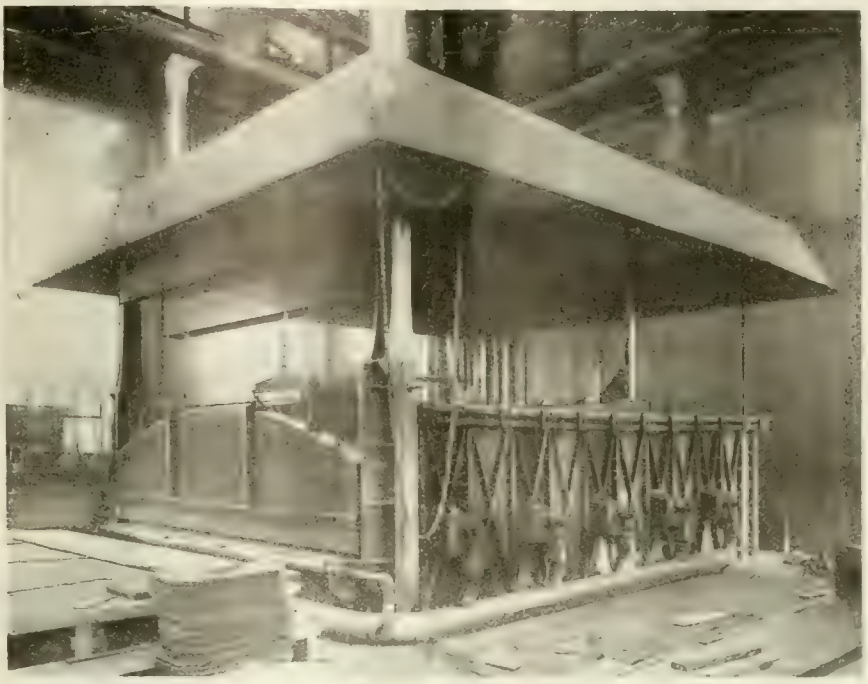


Send for Catalogue Series B6

Codes: Liebers Western Union

Complete plant equipment for making screws of types shown above. All machinery automatic. The almost universal use of our machinery proves its worth.

Asa S. Cook Co.
Hartford, Conn.



Any Size

Illustration shows a Plate Heating Furnace installed in the plant of Canadian Vickers Ltd., Montreal.

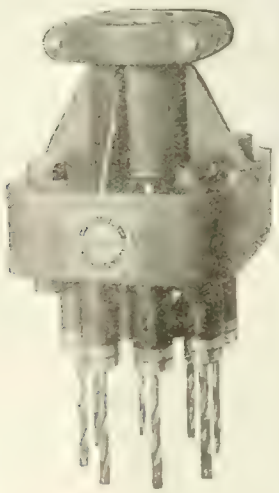
Your proposition, if out of the ordinary, would be bettered by our co-operation. Get in touch with us.

Mechanical Engineering Co., Ltd.

Room 308, Bank of Toronto Bldg., Montreal

Three Rivers, Que., Canada

2 Minutes or 20?



This Is The Vital Question



Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

THE HŒFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Co., Limited

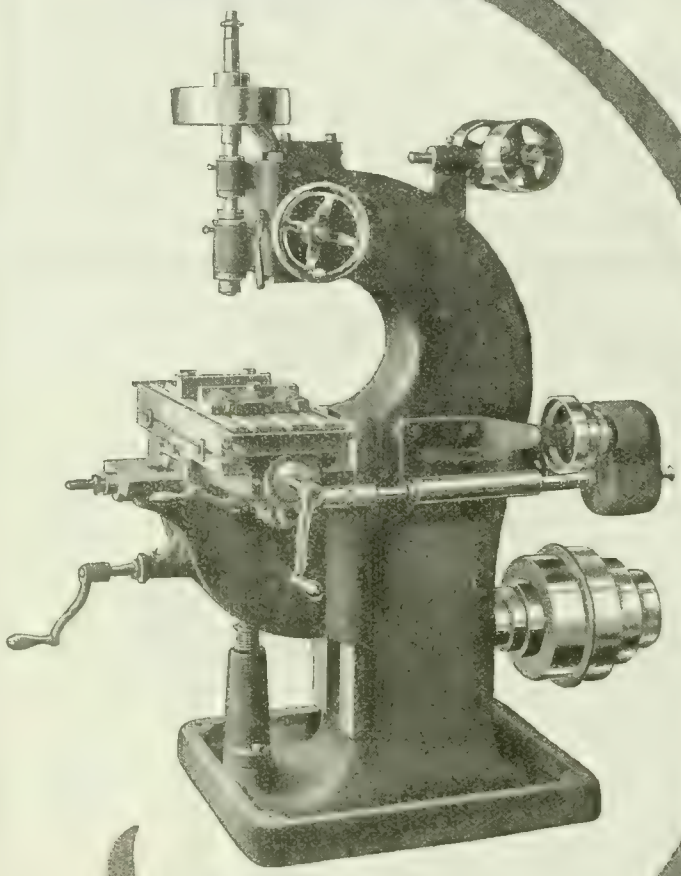
"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

BRISTOL

Bristol Vertical Milling Machine

A Tool of Large Capacity





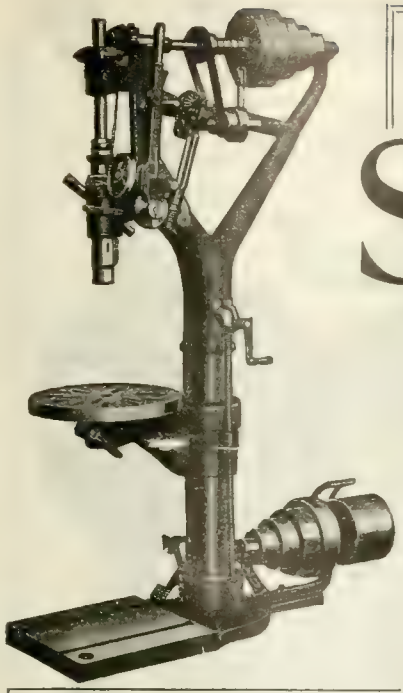
Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longtitudal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

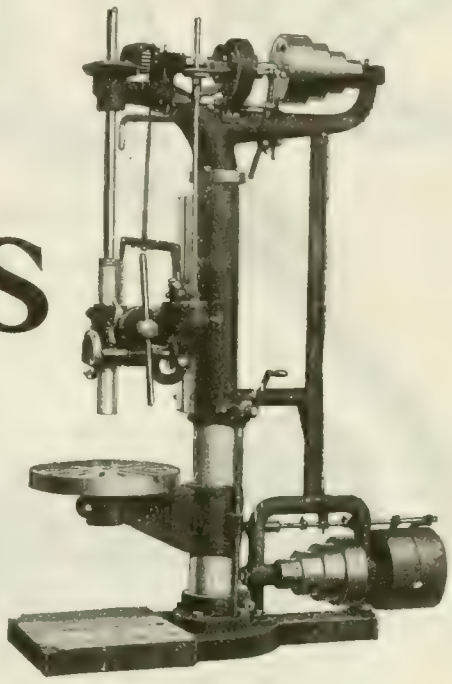
Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.



Meet the keen competition of peace times by putting into your shop faster, stronger and more accurate upright drilling machines. Sixty-four years' drill building experience is back of these perfected

Silver Drills



The 25" Silver Drill has eight spindle speeds and six positive geared feeds. The 20" Silver Drill is built in four distinct styles with round or square base. Furnished singly or in gangs of 2, 3 or 4 spindles.

Write for further facts.

The Silver Mfg. Co.

290 Broadway

SALEM OHIO

Prompt Deliveries

RICKERT-SHAFER TAPPERS

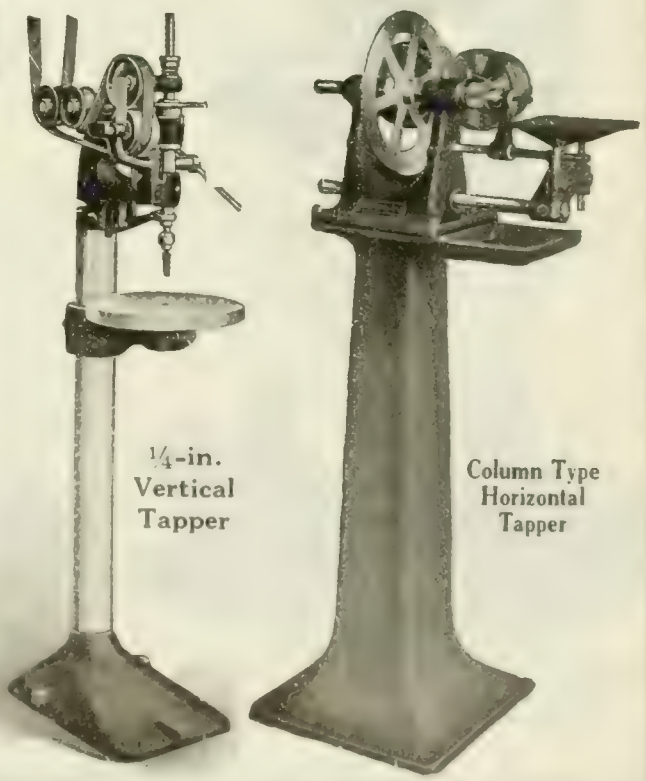
Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.

Write for specifications



¼-in. Vertical Tapper

Column Type Horizontal Tapper

The Rickert-Shafer Co.

ERIE, PA., U.S.A.

FRED HERBERT, Foreign Agent, Coventry, England.

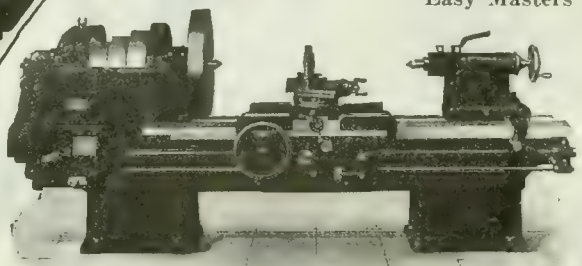
SIDNEY

For SERVICE

Heavy Duty Lathes

The 25-inch Heavy Duty Quick Change Sidney shown below is the last word in lathe construction. Every possible improvement will be found in this late model. Bed lengths available are 10, 12, 14, 16, 18 and 20 feet. Also built with a 27-inch swing.

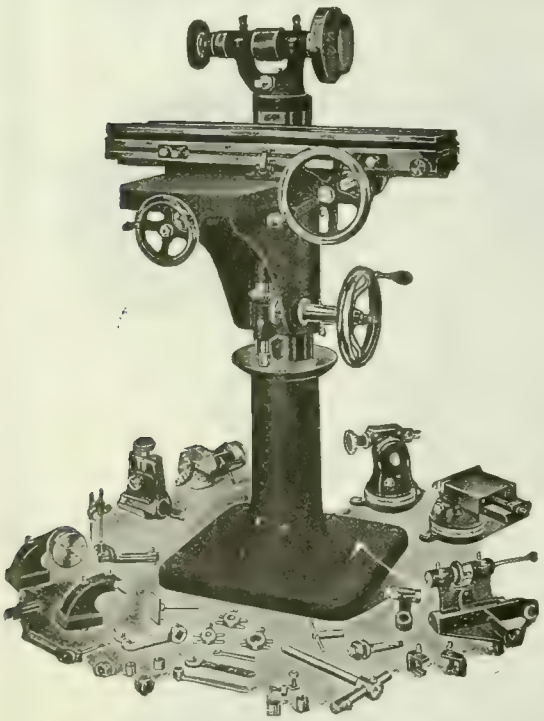
Easy Masters of Big Jobs



Regardless of the severity of work, dependence put on Sidney Lathes has never been misplaced. The Sidney line has made good—with a vengeance. New Bulletin just issued on 25-inch machine. Write to-day!

The Sidney Tool Company
SIDNEY, OHIO

CANADIAN AGENTS:
The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.



The Greenfield Universal Grinder

For General Tool Room Work

This Grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

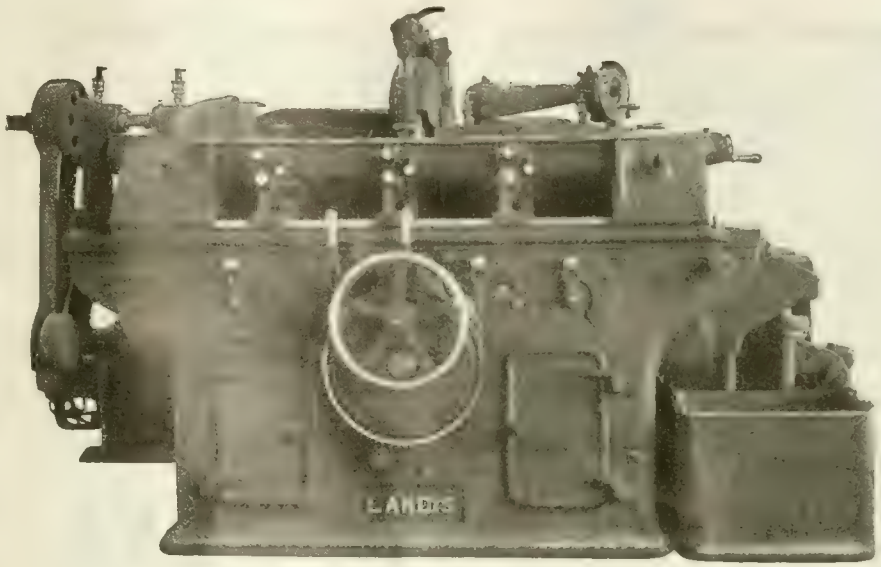
These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.

LANDIS

Self-contained Plain Grinding Machine



No matter how excessive the tool-load may be, there can be no variation of the degree of accuracy because the work is held stationary —and "the wheel travels."

In addition the Landis is compactly and rigidly built to avoid any chatter.

A study of the machine will convince you of its many advantages and its fool-proofness. The built-in, labor-saving features insure big production.

Let us send you our catalog.

LANDIS TOOL CO., Waynesboro, Penn.

50 Church Street, New York City

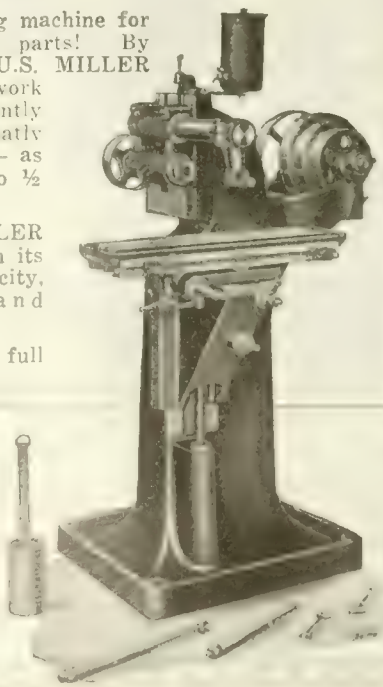
U.S. MILLER

Reduce Your Milling Costs ⅓ to ½

Don't use a big machine for milling small parts! By adopting the U.S. MILLER you can do the work just as efficiently and at a greatly reduced cost — as much as 1/3 to ½ lower.

The U.S. MILLER stands alone in its class for capacity, accuracy and speed.

Write for the full details.



United States Machine Tool Co.

CINCINNATI

Ohio U.S.A.

Rivet Speed



One every second is a speed which this Grant Rivet machine will keep up definitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

We are rivet machine specialists. Get in touch with us.

Grant Man'fg. & Machine Company

Holland Avenue - - Bridgeport, Conn., U.S.A

THE BEST GEARED HEAD LATHE MADE

Best in Simplicity : Best in Rigidity : Best in Number of Speeds

We have for Immediate Delivery 18" Geared Heads

10 Speeds (not as in most makes)
Only 4 Levers for all changes
All Gears of Steel
All Geared Heads Ball Bearing
No Over Hang

ARE NOT THESE ATTRACTIVE TO YOU ?

IMMEDIATE DELIVERY ALSO --- Cone Head 18" by 8' and 10', 24" by 12' and 16'.
Quick delivery any other lengths.

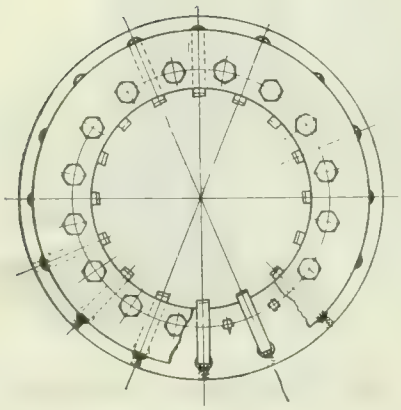
IMMEDIATE DELIVERY---14" and 16" Cone Head.

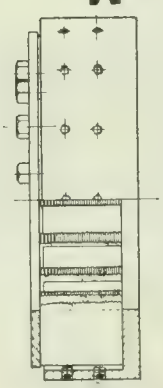
THE CISCO MACHINE TOOL CO., Cincinnati, U.S.A.

Builders of 14" - 16" - 18" - 24" - Lathes (Engine or Tool Room)
Cone Drive, Motor Drive, Geared Head, Motor Drive Geared Head

The Lathe with the Pull : The Lathe of Simplified Accuracy

SMALLEY
GENERAL THREAD MILLER





Cuts Quality Milling Costs

Smalley-General Thread Miller reduces costs, increases output and improves the accuracy of the finished product. Accompanying blue-prints and time studies show results that should interest you.

MACHINE—Smalley General Thread Miller No. 1.
PIECE MILLED—Chasers for 8" pipe die. Two sets milled at one time.
THREAD—Diameter, 8½"; length, 3⅝"; 8 pitch, Briggs, Ltd.
TIME STUDY—

	Min.	Sec.
Inserting jig in chuck		30
Champfering for leading threads	5	
Milling roughing cut	13	
Finishing cut	8	
Removing jig from chuck		30
TOTAL TIME	27 minutes	

for two sets of chasers or 13½ minutes per set.
MILLING FEED—Roughing cut, 2" per minute. Finishing cut, 3" per minute.
MATERIAL—Rex A Tool Steel.
NOTE—Jig was arranged so as to hold two sets of chasers. Chuck was an air collet.

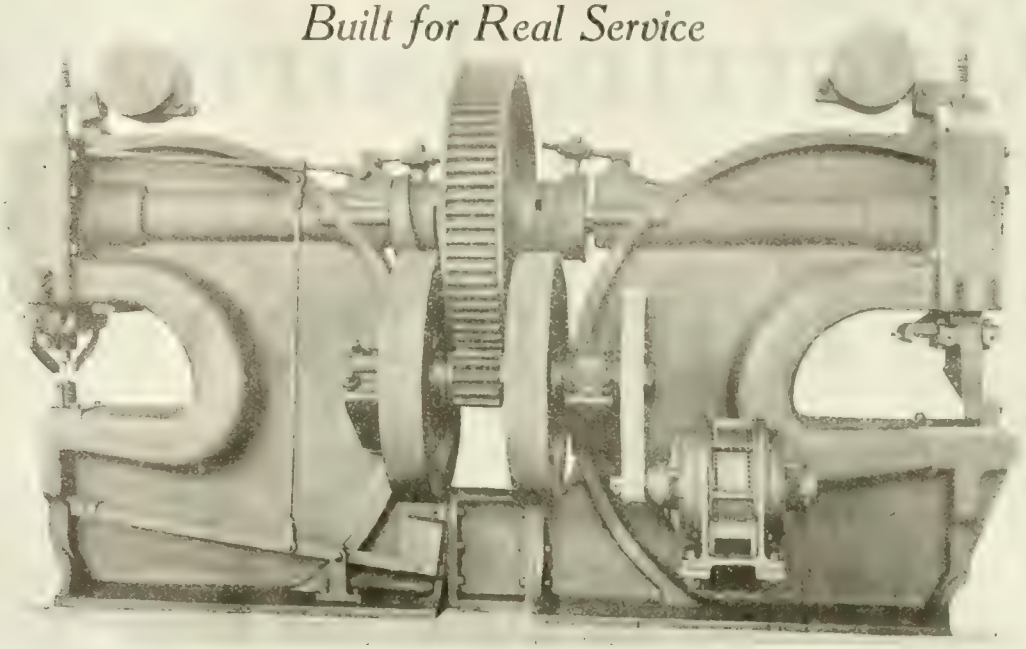
Consult us on every phase of thread milling. We will show you how to cut the costs.

Smalley General Company, Inc.
Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

WICKES' Heavy Duty Double Punch

Built for Real Service

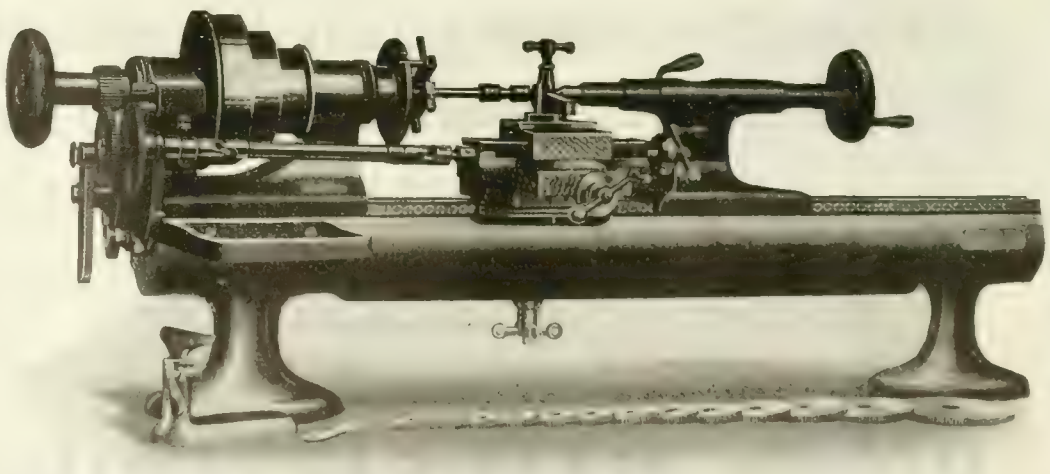


We also manufacture High Grade Horizontal and Vertical Rolls, Angle Rolls, Single Punches, Shears, Spruce Cutters, Radial Wall Drills or Counter-sinking Machines, Flanging Clamps and Heavy Duty Engine Lathes. *Ask for Catalogue.*

WICKES BROS., SAGINAW, MICH., U.S.A.

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

Electric Furnaces and Equipment

THURY REGULATORS, NEW TYPE

ELECTRODE WINCHES
ELECTRODE HOLDERS
MAGNETIC BREAKS
ROOF COOLER RINGS
HAND CONTROLS
BUSS BARS SYSTEMS

ELECTRIC FURNACES
FOR SMELTING FERRO ALLOYS AND REFINING STEEL
PORTABLE ELECTRIC HOISTS, MONO RAIL HOISTS,
GENERAL CONSULTING

VOLTA MANUFACTURING CO.
WELLAND, ONTARIO



"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

Heat Under Accurate Control

Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, are features that distinguish

BELLEVUE FURNACES

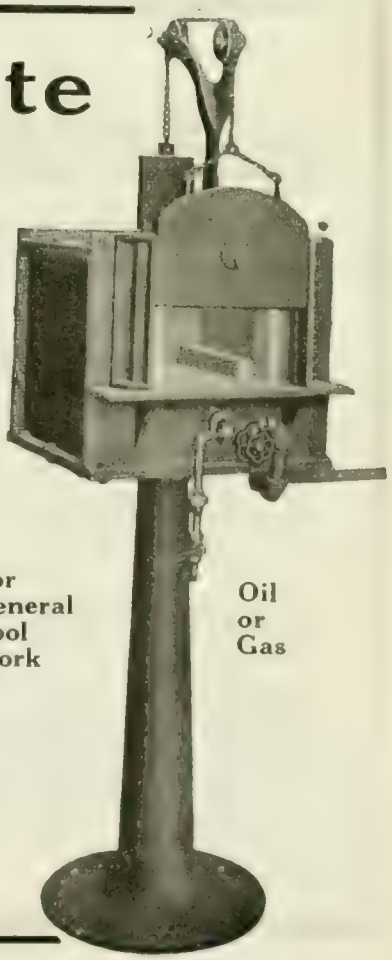
These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

Let us advise you about your heat-treating problems.

Bellevue Industrial Furnace Company
Julius C. Hinz, President
703 Bellevue Ave. - Detroit, Mich.

Representatives in Canada: H. W. PETRIE, LIMITED, Toronto, Canada



For General Tool Work

Oil or Gas

Photographic Copying
The PHOTOSTAT

(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."



This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

The PHOTOSTAT Copies

Pencil Drawings, Ink Drawings,
Tracings, Reports
Shipping Lists, Data Sheets,
Contracts, Ledger Pages,
Illustrations for Salesmen, Insurance Records,
Sketches, Blue Prints,
Specifications, Maps,
Legal Documents, Graphs,
Cuts and Drawings for Advertising, etc.

Manufactured by the Eastman Kodak Company exclusively for the

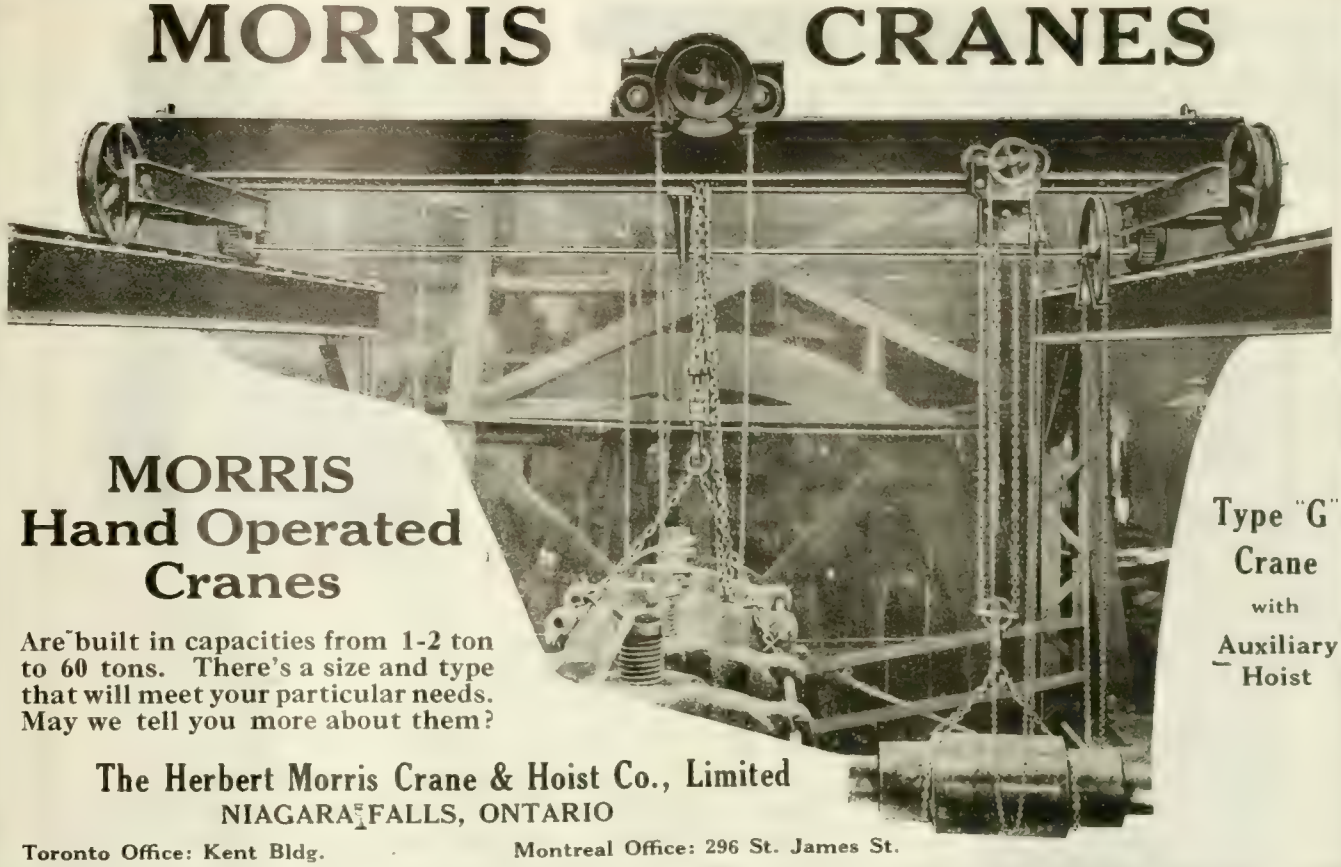
COMMERCIAL CAMERA COMPANY
343 STATE STREET, ROCHESTER, N. Y.

CHICAGO NEW YORK CITY PHILADELPHIA PROVIDENCE WASHINGTON

AGENCIES:

Alfred Herbert, Ltd., Coventry, England
Societe Anonyme Alfred Herbert, Paris, France
Societa Anonima Italiana Alfred Herbert, Milano, Italy
Graham Broters, Stockholm, Sweden

MORRIS CRANES



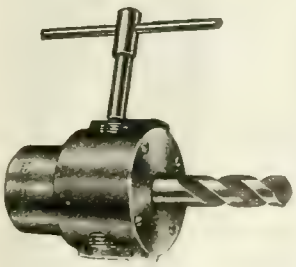
MORRIS Hand Operated Cranes

Are built in capacities from 1-2 ton to 60 tons. There's a size and type that will meet your particular needs. May we tell you more about them?

Type "G" Crane with Auxiliary Hoist

The Herbert Morris Crane & Hoist Co., Limited
NIAGARA FALLS, ONTARIO

Toronto Office: Kent Bldg. Montreal Office: 296 St. James St.



UNION
POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best of results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION Manufacturing Co.
New Britain, Conn.

New York Office 26 Cortland St.

Makers of a complete line of chucks.

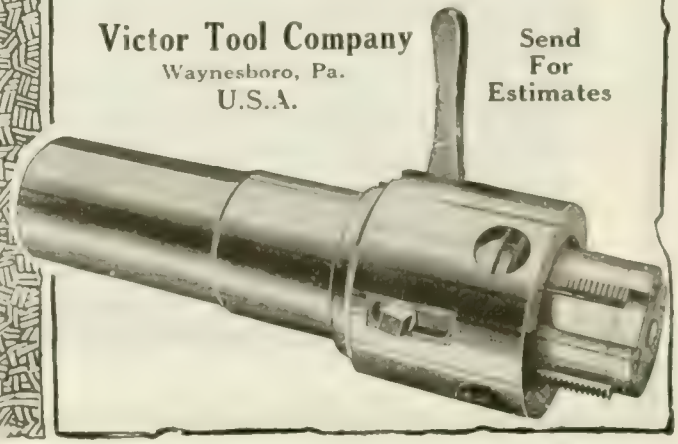
We wanted something original— this is what we got

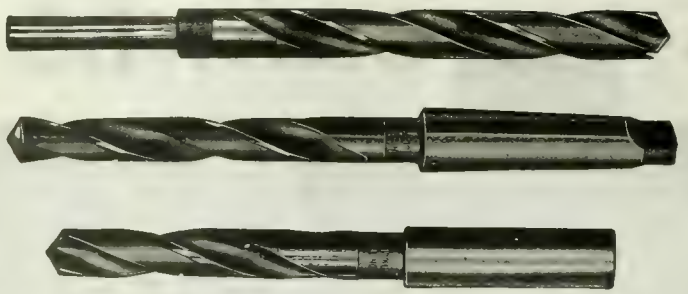
"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates



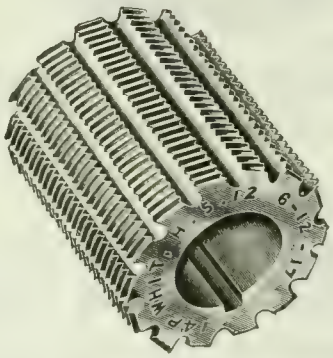




(Carbon and High Speed Steel)

BUTTERFIELD

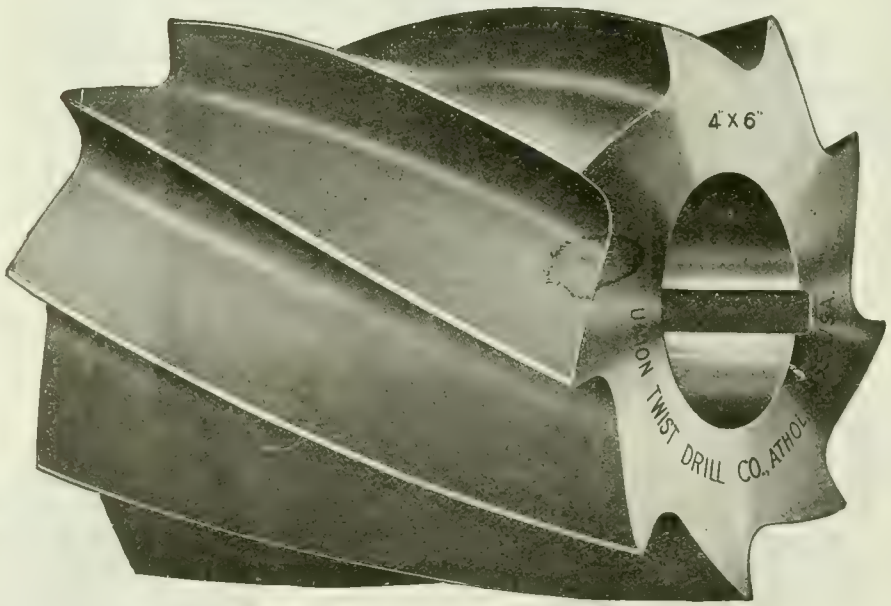
TWIST DRILLS, GEAR AND MILLING CUTTERS



Their ability to serve accurately and long equals that of Butterfield Taps, Dies and Reamers—the sincere praise of a thousand users wouldn't be a better recommendation.

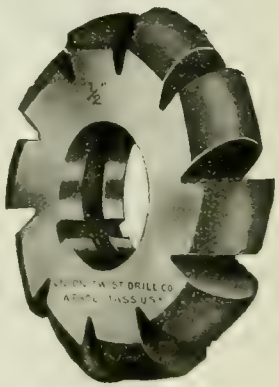
They are the happy result of a great combination of specially trained men and the finest special machinery.

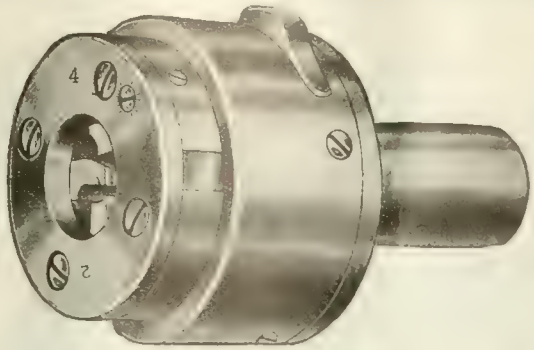
OUR COMPLETE LINE OF DRILLS AND CUTTERS ARE FULLY DESCRIBED IN OUR CATALOG A. Be sure to send for a copy.



Butterfield & Co., Inc., Rock Island, P.Q.

Toronto Office: 220 King Street West





H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

CUSHMAN

We've been Manufacturing

Nothing but Chucks and Their Accessories

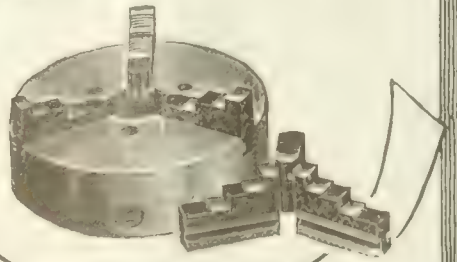
FOR NEARLY 60 YEARS

AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

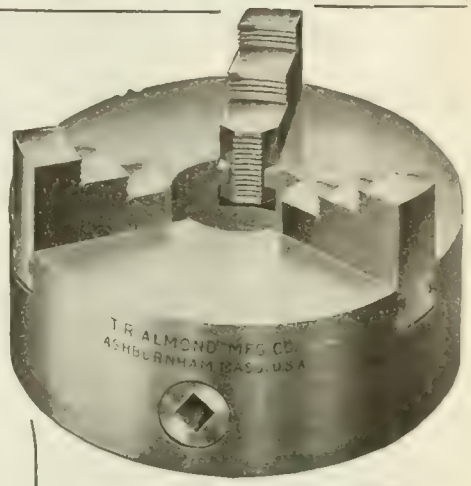
Let us send you our catalogue.

Cushman Chuck Co., Hartford, Conn., U.S.A.

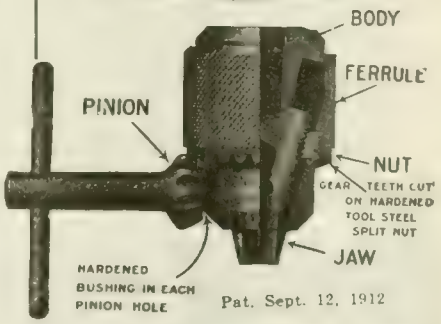


ALMOND CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5", 6", 7½", 9" and 12".



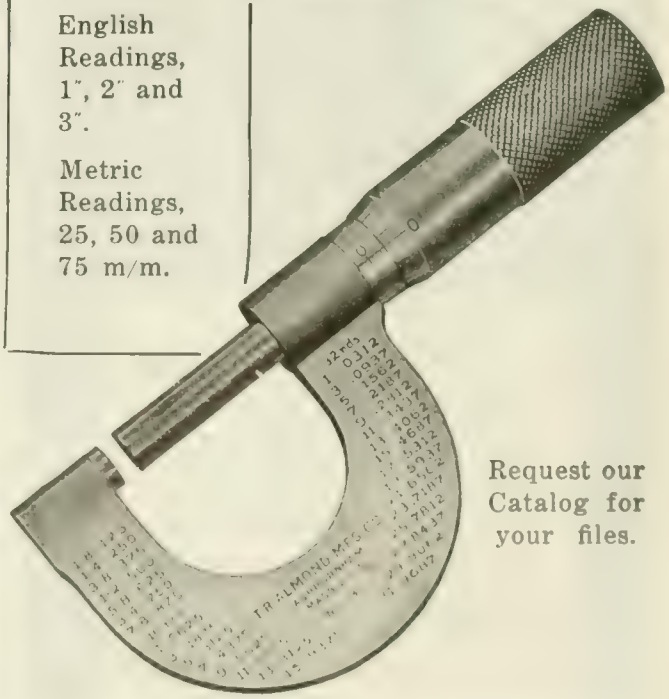
Geared Nut Drill Chucks, in various capacities, 0" to 1".



Micrometer Calipers—

English Readings, 1", 2" and 3".

Metric Readings, 25, 50 and 75 m/m.



Request our Catalog for your files.

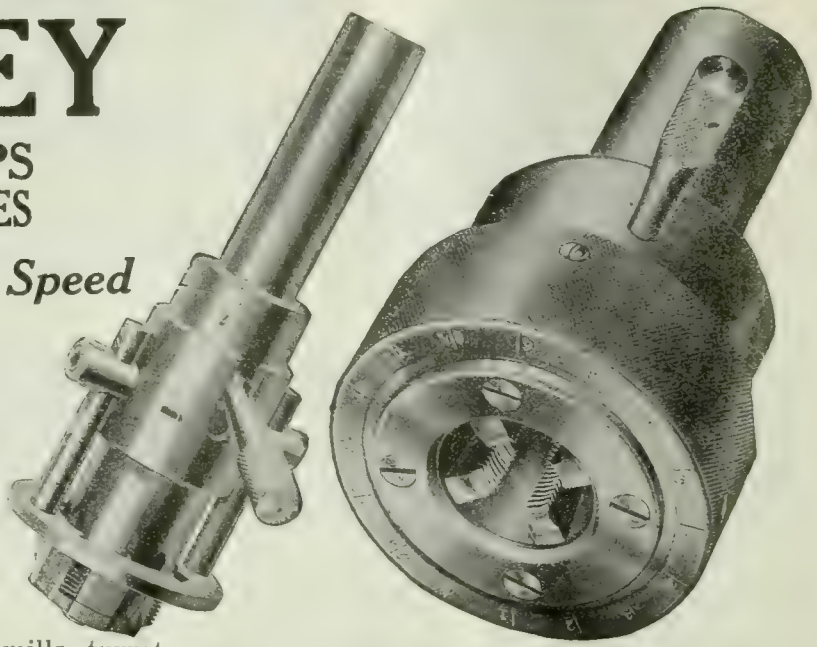
T. R. ALMOND MFG. CO.

6 Maple Avenue, Ashburnham, Mass.

MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed

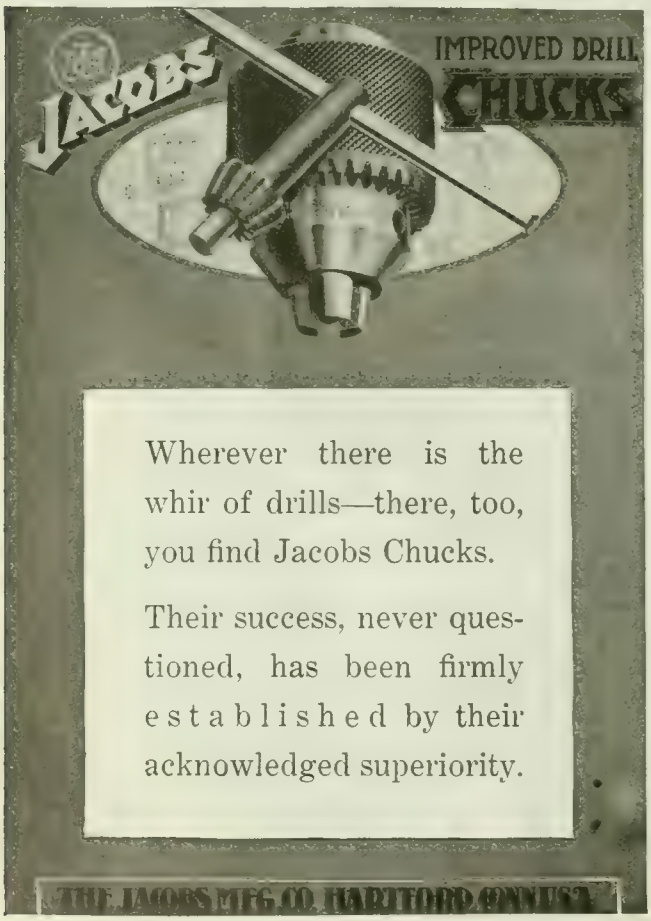


MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and on all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the cost.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.



Look at this again —closely

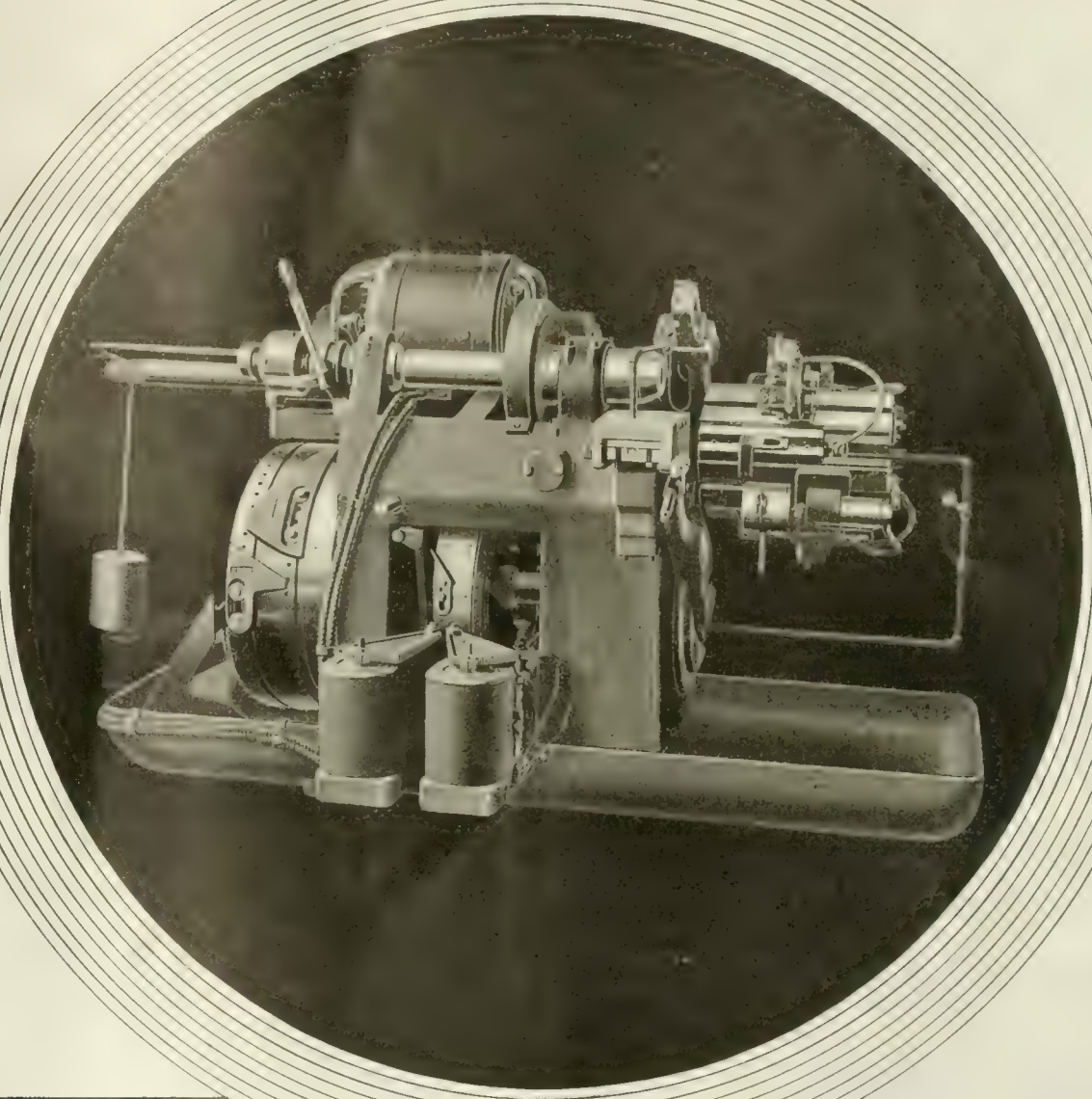
and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company

Hartford, Conn.



Let's be specific:

A comparison of two different Turret Lathe jobs for accuracy or for output, merely on heresay or opinion has often resulted in a new attitude when the real figures were known.

Gridley Automatic Turret Lathes stand or fall by their specific performance on *your* work in your shop. May we quote you *specifically?*

Capacities 2¼-5".

THE NATIONAL ACME COMPANY

AUTOMATIC SCREW MACHINERY AND ITS PRODUCT

CLEVELAND WINDSOR NEW YORK BOSTON CHICAGO DETROIT MONTREAL

Representatives in Principal Foreign Countries

HINTS TO BUYERS

CRANES
All Kinds
GEO. ANDERSON & CO. of CANADA, Ltd.
157 Craig St. W., MONTREAL, Que.

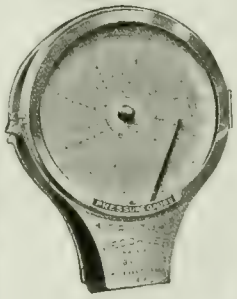
PRESSES and SHEARS
Sheet Metal Working Machinery
THE D. H. STOLL CO., INC.
26 Lansing St., BUFFALO, N.Y.

JAMES BALLANTYNE
HEATING and PLUMBING CONTRACTOR
ALSO
MACHINE SHOP and BLACKSMITH WORK
163 NAZARETH ST.
MONTREAL, P. Q.

Machine Work Wanted for Lathes, Shaper, Milling Machine and Planer, etc.

Quotations given on all classes of work. Wrought Iron Pipe Ends made to order, ¼ to 8". Pipe Cut and Threaded, ⅛ to 12".

Write for Prices.

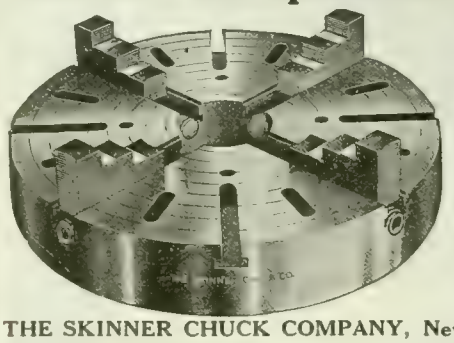


Write for Your Copy of the New Catalog
Learn how you can secure and maintain uniform operating conditions in your power plant. Learn how to furnish positive proof instead of mere assertions by reading our new Catalog No. I-1001.

TRADE MARK
BRISTOL'S
REG U S PAT OFFICE
RECORDING GAUGES

are unique in their extreme simplicity of construction. The continuous night and day records obtained with these recorders show the actual pressure maintained throughout the twenty-four hours.

THE BRISTOL CO., WATERBURY, CONN.
Branch Offices: Boston New York Pittsburgh Chicago San Francisco

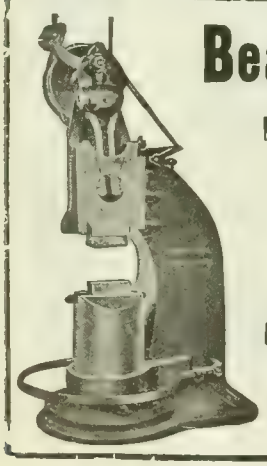
Skinner Independent Chucks


FOR HIGH SPEED WORK
IRON OR STEEL BODY
The last word in chuck construction.
Wide jaws; hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc
Write us to-day for prices.

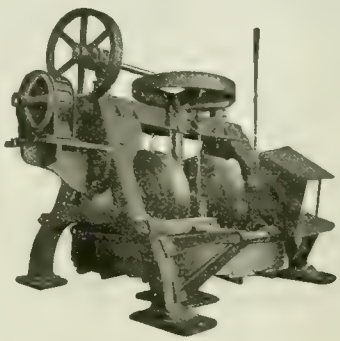
THE SKINNER CHUCK COMPANY, New Britain, Conn.
New York Office: 94 Reade St., N.Y.
Factory and Main Office: New Britain, Conn.
London Office: 149 Queen Victoria Street
San Francisco Office: Rialto Building

STEEL CASTINGS
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.
PROMPT DELIVERY

Manitoba Steel Foundries, Ltd.
1204 McArthur Building
Winnipeg - - - Manitoba



Beaudry Hammers
FOR GENERAL FORGING
Save Fuel, Time and Labor. Cut Forging Costs in two.
BELT OR MOTOR DRIVEN
BEAUDRY & COMPANY, Inc.
141 Milk Street, Boston, Mass.
Alfred Herbert, Ltd., Coventry, England, London, Paris, Calcutta, Yokohama.

Canadian Steel Foundries Need Frost Improved Sand Mills


WINNING FEATURES
Heavy Mullers
Unloading Device
Motor or Belt Drive

The Frost Mfg. Co.
112 W. Adams St., Chicago

DIAMOND POINTED TOOLS



Our line comprises Diamond Pointed Tools for every industrial purpose. We are also equipped to furnish promptly special Diamond Pointed Tools of every variety. Quality products.

ORDER FROM ST. CATHARINES if more convenient. Complete stock — quick service. Goods submitted on memorandum to responsible firms.

Wheel Trueing Tool Company, 88 West Pitt Street, Windsor, Ontario

John W. Gordon, Manager, 5 James St., St. Catharines.

CLUTCHES

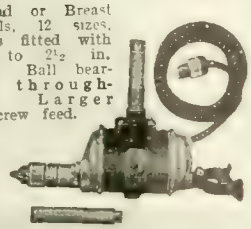
Combined Jaw and Friction. Friction only.
Gas Engine Clutches. Jaw Clutches.
Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd., Canada
MONTREAL Factory: Aurora, Ont. TORONTO

GRAY IRON ALUMINUM BRASS
BROCKVILLE FOUNDRY CO
Brockville, Ontario
CASTINGS

SENT ON TRIAL

Hand or Breast Drills, 12 sizes, sizes fitted with ¾ to 2½ in. cap. Ball bearing throughout. Larger screw feed.



We make complete line of Portable Electric Drills and Grinders for all purposes. Especially built to withstand hard usage. For all currents and voltages.

Catalog?

Cincinnati Electrical Tool Co., Cincinnati, Ohio
New York Office: 50 Church Street

STEEL CASTINGS

DELIVERY **QUALITY**

JOLIETTE STEEL CO.
LIMITED

Sales Office: MONTREAL, Que.
Works: JOLIETTE, Que.

SEND US YOUR INQUIRIES AND PRINTS FOR QUOTATIONS
ON **SPRING SHACKLE BOLTS** OR
PRESSED STEEL AND BRASS GREASE CUPS OILERS OIL CUPS



"PLAIN" "SECTIONAL"

Samples and Catalogues Sent on Request

Canadian Winkley Co. Limited
Windsor, Ont.

SMELTERS & WELDERS GOGGLES

We have a style to meet every requirement



Write for Catalogue
Consolidated Optical Company
Montreal Toronto Winnipeg Vancouver

WILKINSON & KOMPASS
TORONTO HAMILTON WINNIPEG

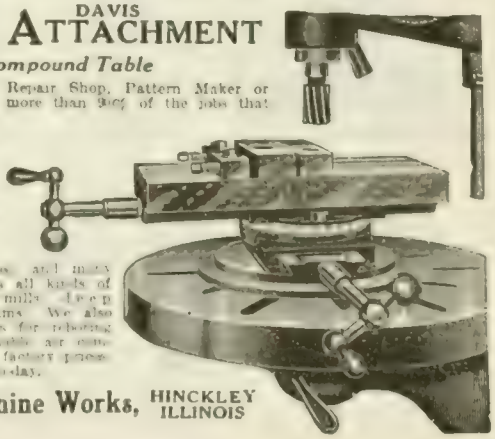
IRON AND STEEL
HEAVY HARDWARE

Mill Supplies **Automobile Accessories**

WE SHIP PROMPTLY

THE DAVIS MILLING ATTACHMENT
and Compound Table

For the Die Maker, Repair Shop, Pattern Maker or Garage, will perform more than 80% of the jobs that come up.



For any Drill Press 12" to 42" swing. Big Economy. Big convenience - Small Price. It relieves your large millers, saves in handy grinding castings. Cuts all kinds of gears and many other odd jobs. Cuts all kinds of gears perfectly, mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a complete set cuts—all at special factory prices. Write for circulars today.

Hinckley Machine Works, HINCKLEY ILLINOIS



A BALATA BELTING

Which We Guarantee Second To None And Entirely Satisfactory

Try One And Be Convinced

J.C. McLAREN BELTING CO. Limited

MONTREAL TORONTO WINNIPEG

Blast Gate Supersedes Gate Valves and Stop Cocks



(Patented)

"Would certainly recommend this type of blast gate to anybody using pressure blowers."

CHAPMAN DOUBLE BALL BEARING CO. OF CANADA, LTD.
Toronto, Ont.

For low and moderate pressures our New Air-Tight Blast Gate easily supersedes the heavy, cumbersome, expensive and slow-acting gate valves and stop cocks.

Costs only a fraction of what you pay for gate valves and stop cocks and saves time and labor.

Write for Circular 123-T. It tells how our blast gate is made, how it works and what users think about it.

W. S. ROCKWELL COMPANY
Furnace Engineers and Contractors
50 Church Street, New York (Hudson Terminal Bldg.)
Canadian Distributors: Drummond, McCall & Co., Ltd., Montreal.

DARLING BROTHERS, LIMITED
Engineers, Manufacturers and Founders
120 Prince Street, MONTREAL, P. Q.

Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

GEAR

GEARS AND GEAR CUTTING SPROCKETS AND CHAINS

In stock and to order, any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

Grant Gear Works, Inc., 151 Pearl St. Boston, Mass. U.S.A.
G. B. GRANT

PRESSES—ALL TYPES

BAIRD

Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines. Grinders.
Special Machines.

Baird Machine Co., Bridgeport, Conn., U.S.A.

Toronto Testing Laboratory LIMITED
METALLURGISTS CHEMISTS FUEL ENGINEERS
160 Bay St., Toronto.

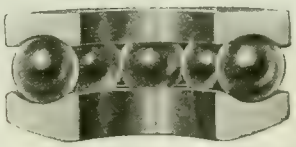
Tests of Metals, Fuels, Oils, Water, Etc.
INDUSTRIAL RESEARCH



NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING

Send for complete catalogue showing 50 styles 10 to 100 tons capacity.

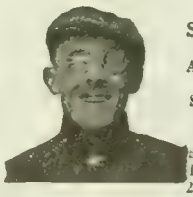
Made only by A. O. NORTON, Limited
Coaticook, Prov. Quebec, Canada



Rochester Thrust Bearings
BALL THRUSTS

Big Ones - Little Ones. Special and Standard. All Good. Catalog.

ROCHESTER BALL BEARING CO., Inc.
ROCHESTER, N.Y.



Send for our New Catalog of
SAFETY AND FIRST AID EQUIPMENT

We Manufacture
Adjustoglas Goggles
Respirators
Safety and Danger Signs
First Aid Cabinets
Hospital Equipment

Masks and Helmets
Leather and Asbestos
Leggings and Clothing
And Everything for Safety

THE STRONG, KENNARD & NUTT Co.,
2044 E. 9th Street
Cleveland, Ohio.

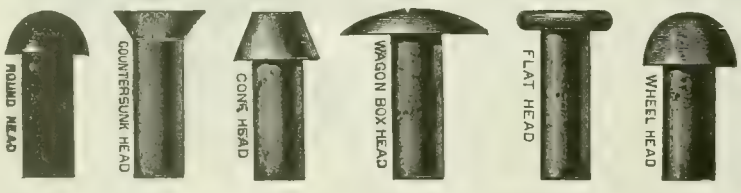
Oxy-Acetylene Welding and Cutting Apparatus

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. NY.

Carter Welding Co., General Dealers Toronto

For Davis-Bournonville Oxy-Acetylene Apparatus

General Office and Factory, Jersey City, N.J.
Canadian Factory, Niagara Falls, Ont.
Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, Detroit, St. Louis, San Francisco, Seattle.



WE MANUFACTURE RIVETS of every description, 5/8 inch. dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

FOR EVERY INDUSTRIAL REQUIREMENT

WILLSON GOGGLES

ONE PAIR OR 20,000 PER DAY

WRITE FOR CATALOG

T. A. Willson & Co., Inc. *Canadian Office:* 23 Scott St., Toronto

Forrest, Jackson & Forrest

Engineers, Contractors and Manufacturers' Agents

Portable Cranes, Turntables, Transveyors, Plastic Metallic Packing

HEAD OFFICE : 222 Craig St. W., Montreal Can.

For Hardness Testing



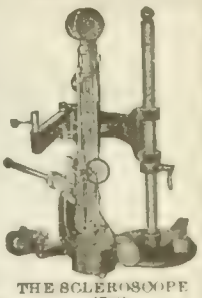
THE PYROSCOPE

in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE



THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.

BATH Universal Manufacturing Grinders

built by

Universal Grinding Machine Company

Fitchburg, Mass. *U. S. A.*

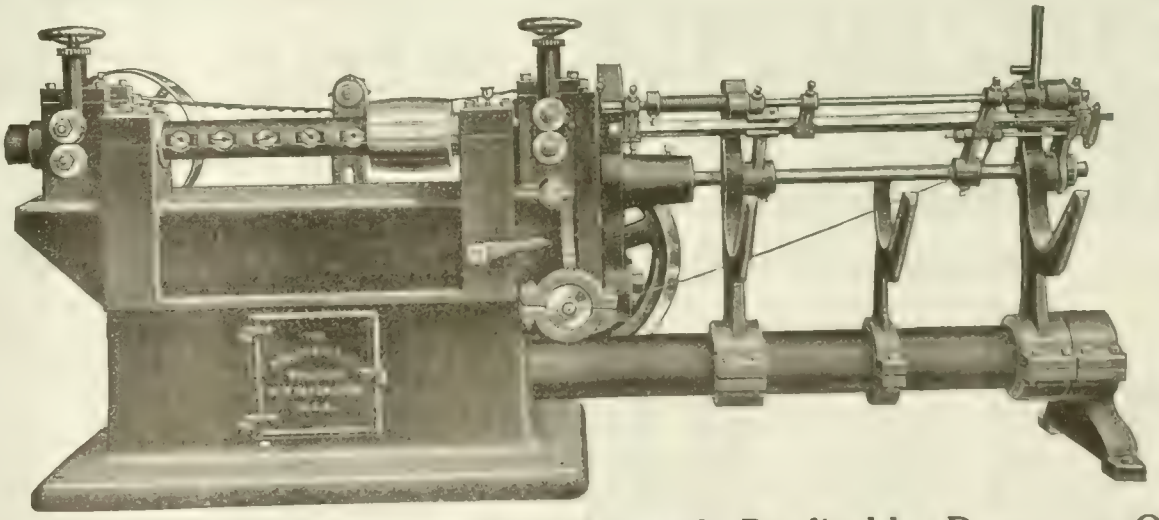
FITCHBURG

Plain Cylindrical Grinders

Built by

Fitchburg Grinding Machine Co.

FITCHBURG, MASS., U.S.A.



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we'll be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1866

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

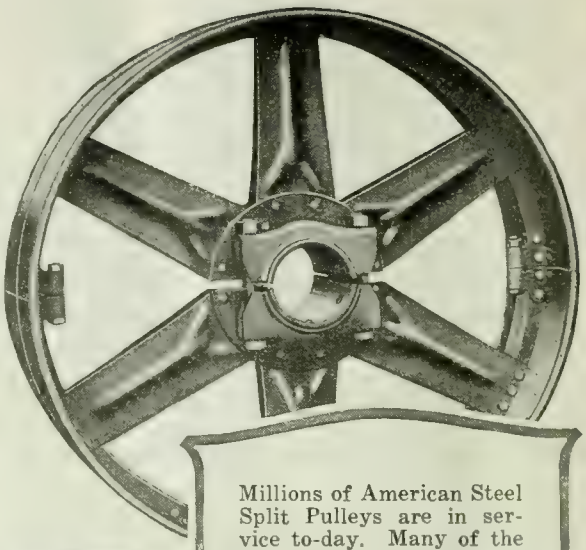
End Transmission Losses

Air resistance and belt slip are wasting a lot of power and coal in many plants where quite a number of pulleys are employed. American Steel Split Pulleys, the only pulleys with grooved faces for air escape, can check these losses. They are **guaranteed** for minimum air resistance and belt slip.

AMERICAN STEEL SPLIT PULLEYS

These pulleys are constructed to give maximum strength with light weight. They are guaranteed for double belt duty, recommended for high rim speeds and are very easy to install. Any pulley failing in service from any defect in material or manufacture will be replaced.

Write for free book, "Getting Maximum Pulley Efficiency," a valuable treatise on Pulleys





Millions of American Steel Split Pulleys are in service to-day. Many of the largest plants in the country are equipped with them.

"Americans" are distributed through supply houses from parent stocks in New York, Chicago, Philadelphia, Boston, New Orleans, San Francisco, Seattle.

The American Pulley Company
PHILADELPHIA, PA.

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being **accurate.** Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

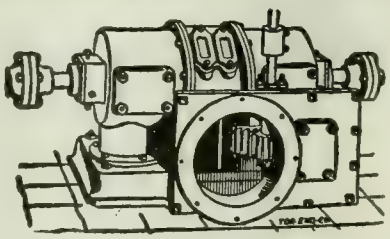
Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN



WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

J. C. WILSON & CO.
BELLEVILLE, ONTARIO

Canadian Machinery BUYERS DIRECTORY

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Aikenhead Hardware Co., Toronto, Ont.
Brantford Emery Wheel Co., Brantford, Canada
Canadian Fairbanks-Morse Co., Montreal.
The Geo F. Foss Mchy. & Supply Co., Montreal
Ford-Smith Mach. Co., Hamilton, Ont.
Norton Co., Worcester, Mass.
Plewes Ltd., Winnipeg, Man.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa
Rice, Lewis & Son, Toronto, Ont.
Williams & Wilson, Limited, Montreal Que

ACETYLENE
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

ACETYLENE GENERATORS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

ACORN DIE AND HOLDERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

ACCUMULATORS, HYDRAULIC
Canadian Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

AIR COMPRESSORS
Darling Bros., Ltd., Montreal, Quebec
Williams & Wilson, Limited, Montreal, Que

AIR CYLINDERS
Smalley-General Co., Inc., Bay City, Mich.

AIR RECEIVERS
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.
Welding & Supplies Co., Montreal, Que.

AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto.
United Brass & Lead, Ltd., Toronto.
Tallman Brass & Metal Co., Hamilton
Williams & Wilson, Limited, Montreal, Que.

ALLOY, STEEL
Armstrong, Whitworth, of Canada, Montreal, Que.
Boker & Co., Inc., H., Montreal Que.
Firth & Sons, Thos., Montreal, Que.
General Steel Co., Milwaukee, Wis.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

ARCHITECTURAL IRON
Page Steel & Wire Co., Adrian, Mich

ARRESTERS, DUST
Northern Crane Co., Walkerville, Ont.
Sheldons Ltd., Galt, Ont.
Pangborn Corporation, Hagerstown, Md

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
National Acme Co., Cleveland, O., and Windsor
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
Williams Machy. Co., A. R., Toronto
Williams & Wilson, Ltd., Montreal, Que.

AUTOMATIC METAL CUTTING-OFF MACHINES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Canada Metal Co., Toronto.
The Geo. F. Foss Mchy. & Supply Co., Montreal

AUTO SHEET METAL MACHINERY
Quickwork Co., St. Marys, Ohio.

BABBITT METAL
Canada Metal Co., Ltd., Toronto, Ont
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton
Wilkinson & Kompass, Hamilton, Ont
Williams & Wilson, Limited, Montreal, Que.

BAND SAWS
Oliver Machinery Co., Grand Rapids, Mich

BALL BEARINGS
anadian Fairbanks-Morse Co., Montreal
an. S K F Co., Toronto, Ont.
hapman Double Ball Bearing Company, Toronto
The Gray Ball Bearing Co., Ltd., Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Rochester Ball Bearing Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que

BALLS, STEEL
The Gray Ball Bearing Co., Ltd., Toronto.
Boker & Co., Inc., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

BALLS BURNISHING
The Gray Ball Bearing Co., Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont
Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont
Williams & Wilson, Limited, Montreal, Que

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie, Ont.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie, Ont.

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont
Williams & Wilson, Limited, Montreal, Que

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids, Mich

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal
Graton & Knight Mfg. Co., Worcester, Mass
Rice, Lewis & Son, Toronto, Ont

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids, Mich

BELTING, BALATA
Baxter & Co., Ltd., J. R., Montreal Que
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Ltd., Montreal

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal.
Can. Link Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Ltd., Montreal
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Federal Engineering Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass
Jones & Glassco, Montreal, Que.
McLaren, J. C., Belting Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que

BELTING, FRICTION AND SURFACE
Can. Consolidated Rubber Co., Ltd., Montreal

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.

BELTING, WOVEN
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Ltd., Toronto, Ont.

BENDING ROLLS (PLUTE & AUGH)
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Bertrams, Limited, Edinburgh, Scotland.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto, Ont.
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio
Williams & Wilson, Limited, Montreal, Que.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

BLACKSMITH WORK
James Ballantyne, Montreal.
The Thos. Pink Co., Ltd., Pembroke, Ont.

BLANKING
Henry Hope & Sons of Canada, Ltd., Peterboro.

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
MacGregor & Co., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont
Prest-O-Lite Co., Inc., Toronto, Ont
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Province, R.I.
McEwen-Edlund Tool Co., Syracuse, N.Y.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co. of Can., Windsor, Ont.

BOARTZ
Anderson & Co. of Canada, Geo., Montreal Que
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Quebec.
MacKinnon Steel Co., Sherbrooke, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Rice, Lewis & Son, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Rice, Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead, Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

BOLTS, STAY
John Morrow Screw & Nut Co., Ingersoll, Ont.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll.

BOLTS, PATCH
John Morrow Screw & Nut Co., Ingersoll, Ont.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto.

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Canadian Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Machine Co., Madison, Wis.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Oliver Machinery Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland, Ohio.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland, Ont.

BRASS AND COPPER BARS, RODS

BRAKES, CORNICE
Peck, Stow & Wilcox Co., Southington, Conn.

AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto.
Tallman Brass & Metal Co., Hamilton, Ont.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co. Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refactories Co. of Canada, Montreal, Que.

BRIDGES, RAILWAY AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.

BRONZE, COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd. ,Walkerville, Ont.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananogue, Ont.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Oberdorfer Brass Co., M. L., Syracuse, N.Y.

CALIPERS
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CALKS, BOOT
Lufkin Rule Co. of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co, Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville, Ont.
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor, Ont.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Sheldons, Limited, Galt, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie, Ont.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland, Ont.

CARRIERS

COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll, Ont.
Alexander Fleck, Ltd., Ottawa.
Greenleafs, Ltd., Belleville, Ont.
Oberdorfer Brass Co., M. L., Syracuse, N.Y.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead Ltd., Toronto.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie, Ont.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
International Malleable Iron Co., Guelph, Ont.
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Sheldons, Limited, Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co. Guelph, Ont.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son Montreal

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt., & Son, Montreal.
Hurlburt, Rogers Mach. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Garlock-Walker Machy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Rice Lewis & Son Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE
Morse Chain Co., Ithaca, New York.

CHAINS, BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, DRIVE
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, New York.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, New York.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Laboratory, Ltd., Toronto.

CHROME VANADIUM STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHROME NICKEL STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Limited, Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., T. R., Ashburnham, Mass
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice, Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Limited, Montreal, Que.

CHUCKS, DRILL AND TAP
Swedish Gage Co., New York, N.Y.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WRENCH
Thomas Elevator Co., Chicago, Ill.

CHUCKING MACHINES
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach Co., Brazil, Ind., U.S.A.
Williams & Wilson, Limited, Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MACHINE



OR HAND

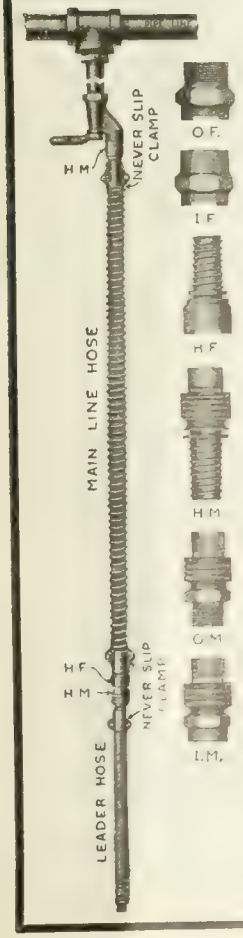
Reamers will be certain to give you satisfactory service if they are marked "MORSE". For smooth, clean holes specify "MORSE" every time

Catalog on request

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD - - - - MASS, U.S.A.

CLEVELAND HOSE SPECIALTIES



Bowes Automatic Air Hose Couplings
Over 1,500,000 in general use

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes, ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instanly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
TheU-shaped Gasket interchanges in couplings ¼-in, to ¾-in.

The Cleco Never Slip Hose Clamp
Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.



CLECO GROOVED HOSE NIPPLE



Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock:



Use Annealed Wire No. 14

Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Catalog No. 14 which illustrates our complete line of Air Tools.
Address all inquiries to

CLEVELAND PNEUMATIC TOOL CO. OF CANADA LTD., 84 Chestnut St., TORONTO
A. R. WILLIAMS MACHINERY CO., TORONTO. WILLIAMS AND WILSON, MONTREAL

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto
Williams & Wilson, Limited, Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Marsh Engineering Works, Ltd., Belleville, Ont
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Williams & Wilson, Limited, Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N. S.

COKE AND COAL HANDLING EQUIPMENT
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can

COLD ROLLED STRIP, ALL METAL
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

COLLARS, SHAFTING
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C., Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.
United Brass & Lead Ltd., Toronto.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont

CONTRACT WORK
Banfield, W. H., & Sons, Toronto.
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Welland Motor & Machine Co., Welland, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Machy. Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COOLERS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Rement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener, Ont.

COPPER, BUS BAR, SHEET, PLATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.

COUNTERSHAFTS
Almond Mfg. Co., T. R., Ashburnham, Mass.
The Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Limited, Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Quebec.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Anderson & Co. of Canada, Geo., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Quebec.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found's & Forgings, Ltd., Welland, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice, Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHED STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.

CUPOLA BLAST GAUGES AND BLOWERS
Sheldons, Ltd., Galt, Ont.

CURB PUMPS FOR OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

CURRENT TRANSFORMERS
Electric Steel & Metals, Ltd., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

CUTTERS, BOLT
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTER HEADS
Oliver Machinery Co., Grand Rapids, Mich.

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Baker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Canadian Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill
Morse Twist Drill & Machine Co New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
Tabor Mfg. Co. Philadelphia, Pa
Whitney Mfg. Co., Hartford, Conn.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago
Bertram & Sons Co., John, Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy. & Supply Co., The Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto, Ont
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy Co., South Sudbury, Mass
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Standard Mchy & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co. Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor, Ont.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co, Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEEP DRAWING DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co. Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Anderson & Co. of Can., Geo., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Windsor, Ont.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal, Que.

DIAMONDS, CARBON & BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pittsburgh Steel Stamp Co., Pittsburgh, Pa.

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Baker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

DIES, THREADING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES, BOLT, PIPE
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIE BLOCKS, HEAVY FORGED
Hammond Steel Co., Inc., Syracuse, N.Y.

DIE FORGINGS
Hammond Steel Co., Inc., Syracuse, N.Y.

DIE FILING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong, Whitworth of Canada, Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Windsor Mach. & Tool Co., Windsor, Ont.
Worth Engineering Co., Toronto, Ont.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.



"You Know What I Want"

CLEVELAND



THE CLEVELAND TWIST DRILL CO., Cleveland, New York, Chicago

Agents for Europe, CLEVELAND TWIST DRILL CO. (GREAT BRITAIN), Ltd., 36-37 Upper Thames St., London E.C.4.

Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Ltd., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

DRAWING
Henry Hope & Sons of Canada, Ltd., Peterboro

DRESSERS, GRINDING AND EMERY WHEEL
Baxter & Co., Ltd. J. R., Montreal, Que.
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford Smith Mach Co., Hamilton, Ont.
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp, Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Henry & Wright Mfg. Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES RADIAL AND TURRETT
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati, Ohio
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Machinery Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Fry's (London), Ltd., London, England.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Reed-Prentice Co., Worcester, Mass.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, VERTICAL
Giddings & Lewis Mfg. Co., Fond du Lac, Wis

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros., Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fry's (London), Ltd., London, England.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
United States Electrical Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont
Williams & Wilson, Ltd., Montreal, Que

ELECTRIC FURNACES
Electric Steel & Metals, Ltd., Welland, Ont.
General Steel Co., Milwaukee, Wis.

ELEVATOR ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton, Ont.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.

DRILLS, CARBON
Joan Morrow Screw & Nut Co., Ingersoll, Ont.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, EMERY
Garlock-Walker Machinery Co., Toronto, Ont.

DRILLS, HIGH SPEED TOOL ROOM
Albany Hardware Spec. Co., Albany, Wis.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong, Whitworth of Canada, Montreal, Que.
Atkins & Co., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
McKenna Brothers, Pittsburgh, Pa.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill.
Perfect Machine Co., Galt, Ont.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Taylor, J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co of Canada, Walkerville, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
The Geo F. Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Wilt Twist Drill Co. of Canada, Walkerville, Ont.
United Brass & Lead Ltd., Toronto

DRINKING FOUNTAINS, SANITARY
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co.
Jones & Glaseco, Montreal.
Morse Chain Co., Ithaca, N.Y.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DRUM CONTROLS
Electric Steel & Metals, Ltd., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Pratt & Whitney Co., Dundas, Ont.
MacGovern & Co., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE
Can. Driver Harris Co., Ltd., Walkerville, Ont.

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Williams & Wilson, Limited, Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Baxter & Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll, Ont.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ENGINE SHAFTS
Hammond Steel Co., Inc., Syracuse, N.Y.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

EXTRUSION DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn

EXTRA TOOL STEEL
J. F. A. Comstedt, New York City, N.Y.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.
United Brass & Lead, Ltd., Toronto.

EYE PROTECTORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Limited, Montreal, Que.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

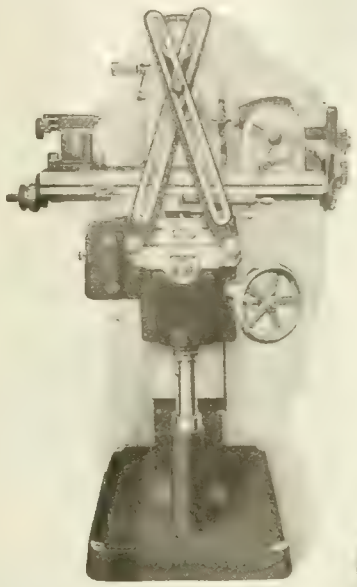
FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.

TRADE FOX MARK
REGISTERED

MILLING MACHINES

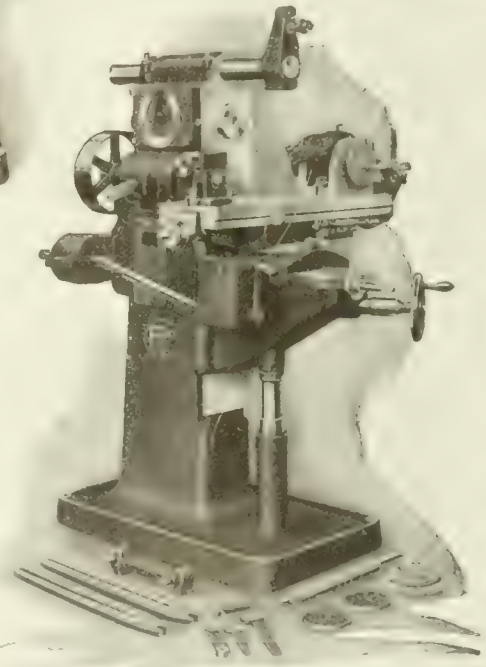
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability**; the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10" Dividing Head with 6" Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2-A Miller.

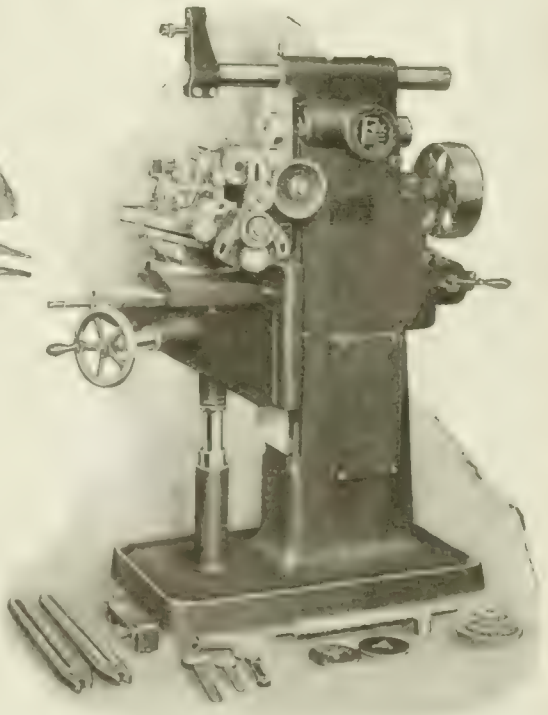
Spindle speeds 12
From 21 to 423 r.p.m.

Table feeds 6
From .317" to 2.79" per min.

Table 8½ x 27"
Long. feed (power) 26".
Vertical feed (hand) 13".
Trans. feed (hand) 8½".

Drive...Single pulley 10 x 3" running 250 r.p.m.

Gears — Hardened steel.
Weight 1,500 lbs.



We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds of them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.

FOX MACHINE COMPANY
1047 W. Ganson St., Jackson, Michigan, U.S.A.

FILES
Wm. Athns & Co., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Marshall, Son & Burney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind
Canada Wire & Iron Goods Co., Hamilton, Ont

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIRE BRICKS
Harbison-Walker Refactories Co. of Canada, Montreal, Que.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Sheldons, Ltd., Galt, Ont.

FORGINGS, STEEL AND IRON
Can. Foundries & Forgings, Ltd., Welland, Ont
Nova Scotia Steel & Coal Co., New Glasgow, N S

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE

FORGING AND WELDING
Victoria Foundry Co., Ottawa.
Can. Billings & Spencer, Ltd., Welland, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co,, Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

FORGINGS, SPECIAL
Armstrong, Whitworth of Canada, Montreal, Que
Canada Foundries & Forgings, Ltd., Welland, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Henry Hope & Sons of Canada, Ltd., Peterboro.

FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Ltd., Montreal.

FUEL OIL SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mechanical Engineering Co., Three Rivers, Que.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Limited, Montreal, Que.

FURNACES, BLAST
Belleview Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield, Mass.
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL, SHELL
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, LEAD AND SALT
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, RIVETING
Standard Fuel Engineering Co., Detroit, Mich.

FUSE BOXES, STEEL
Dom. Forge & Stamping Co., Walkerville, Ont.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser & Co., S. F., Inc., Fort Wayne, Ind

GASOLINE TANKS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GASOLINE PUMPS, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne, Ind

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGES, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont
Toronto Tool Works, Toronto, Ont.
United Brass & Lead, Ltd., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y.

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Victoria Foundry Co., Ottawa.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GENERATORS, ELECTRIC
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson Ltd., Montreal, Que

GENERATORS, MOTOR
MacGovern & Co., Montreal, Que.

GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland, Ohio
Willson & Co., Inc., T. A., Reading, Pa

GOVERNOR, WATER WHEEL
Wilson & Co., J. C., Belleville, Ont.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

GOGGLES
Consolidated Optical Co., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Strong, Kenard & Nutt Co., Cleveland, Ohio
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (SEE LUBRICANTS)

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co. Providence, R.I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati, O
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
United States Electrical Tool Co., Cincinati, O.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
United States Electrical Tool Co., Cincinati, O.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, ROTARY SURFACE
Bristol Machine Tool Co., Bristol, Conn.

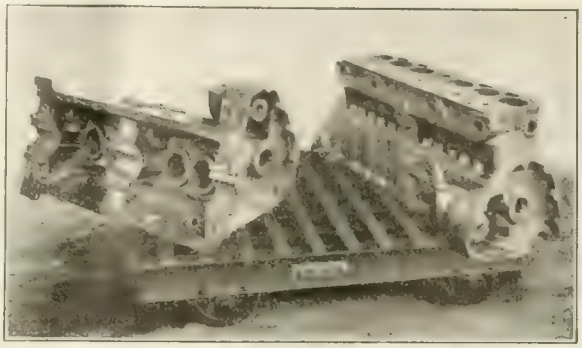
GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ford-Smith Machine Co., Hamilton, Ont.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Wing & Son, J. E., Hamilton, Ont.

GRINDERS, UNIVERSAL, PLAIN
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass
Pratt & Whitney Co., Dundas, Ont.
Reed-Prentice Co., Worcester, Mass.
Gisholt Machine Co., Madison, Wis
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.

How long would it take to clean this Cylinder by your present methods and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

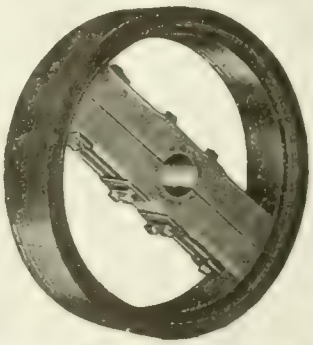
PANGBORN SAND-BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you—and a more attractive product.

PANGBORN
HAGERSTOWN, MD
SAND-BLAST SPECIALISTS

P. O. BOX 8503

BERNARD



WOOD SPLIT **PULLEY**

Why waste power that costs money?

This can be effectively prevented by using "Bernard" Wood Split Pulleys.

Let us quote on your requirements.

The A. Bernard Industrial Company, Fortierville, Quebec

Manufacturers of High Grade Power and Transmission Appliances

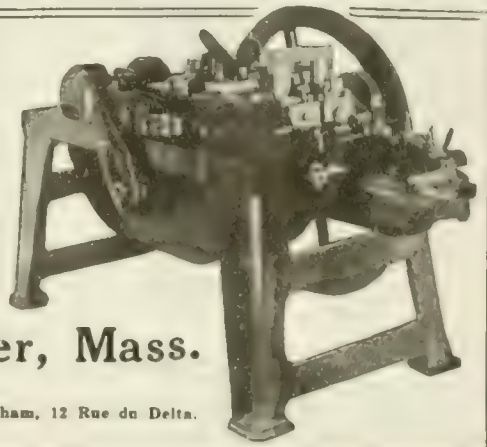
MAKE NAILS! NOT NOISE!

We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to 5/8" diam.



PRACTICALLY NOISELESS IN OPERATION

Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.
Australia: Edwin Wood Pty. Ltd., Melbourne.

Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Limited, Montreal, Que.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Norton Grinding Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Norton Co., Worcester, Mass.

GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.
New Britain Mach. Co., New Britain, Conn.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

GUN AND AMMUNITION SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

GUN TAPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Victor Saw Works, Ltd., Hamilton, Canada.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
McKenzie Machy. Co., D., Guelph, Ont.
Peerless Machine Co., Racine, Wis.
Perfect Machine Co., Galt, Ont.
Racine Tool & Mach. Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Limited, Montreal, Que.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited Montreal, Que.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, MARKING
Matthews, Jas. H. & Co., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston Mass.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAMMERS, SHELL NOSING
Beaudry & Company, Inc., Boston, Mass.

HAND PLANERS
Oliver Machinery Co., Grand Rapids, Mich.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie, Ont.
The Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia, Pa.
Williams & Wilson, Limited, Montreal, Que.

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

HEATING AND PLUMBING CONTRACTS
James Ballantyne, Montreal.

HEAT TREATMENT OF STEE L
The Gray Ball Bearing Co., Ltd., Toronto.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland, Ohio.

HIGH SPEED STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

HIGH SPEED TOOL ROOM DRILLS
Albany Hardware Spec. Co., Albany, Wis.

HIGH SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
J. F. A. Comstedt, New York City, N.Y.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.

HINGES
London Bolt & Hinge Works, London, Ont.

HOBS
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. of Can., Galt, Ont.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTING AND CONVEYING MACHINERY AND ENGINES
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Quebec.
Jones & Glassco, Montreal.
MacGovern & Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal, Que.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal, Que.

HOISTS, ELECTRIC
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Electric Steels & Metals, Ltd., Welland, Ont.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal, Que.

HOLDERS, STEEL DIE FOR MARKING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland, Ont.

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Quebec.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC
Baxter & Co., Ltd., J. R., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

HYDRAULIC MACHINERY
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.
Williams & Wilson, Limited, Montreal, Que.

HYDROMETERS
Taylor Instrument Co., Rochester, N.Y.

HYGROMETERS
Taylor Instrument Co., Rochester, N.Y.

HYGRODEIKS
Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R. I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal, Que.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
United Brass & Lead Ltd., Toronto.

INGOTS, STEEL
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto, Ont.

IRON GREY
Brockville Foundry Co., Brockville, nt.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

IRON SAND
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

IRON, WROUGHT, ROLLED AND PIG
Swedish Steel & Importing Co., Ltd., Montreal.

IRREGULAR CUTTING SHEARS
Quickwork Co., St. Marys, Ohio.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

JACKS, PNEUMATIC
Northern Crane Works, Walkerville.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JOINTERS
The Gray Ball Bearing Co., Ltd., Toronto.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Ltd., Welland, Ont.

KEY SEATERS
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

KNIFE GRINDERS
The Gray Ball Bearing Co., Ltd., Toronto.

LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pt.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, Mich.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que.

LATHE CHUCKS (SEE CHUCKS)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.

LATHES, BORING
Bridgeford Mach. Tool Wks., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LATHES, BAND TURNING
Roelofson Machine & Tool Co., Toronto, Ont.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.

THE PERFECT 18-INCH LATHE

"THE TOOL WITH THE APPETITE"



ALL THAT IT LOOKS TO BE

A machine tool capable of doing the toughest machining jobs, and of doing them economically; a machine tool capable of delivering the most accurate work at a high rate of speed; a machine tool of extreme rigidity, of great power—such is

This Double Back-Geared, Quick Change Gear "Perfect" 18-inch Lathe

You will admire its ability to send production climbing hand in glove with perfect accuracy.
You will appreciate the exclusive features that so noticeably make for operating convenience.
You will be pleased you put it in your shop—and so will the man that runs it.
Ask us to-day for Catalog fully describing this "Perfect" Lathe.

SCREW CUTTING ENGINE LATHE WITH GAP



Accurate. Convenient Design.

Small consumption of Power and Low Price.

A Lathe in a class by itself.

Perfect Machine Co.

GALT, ONT., CANADA

Made by Canadian workmen employed by Canadian firm better and cheaper than any imported tools. For sale by all up-to-date machinery dealers.

Just the Tool for Machine Shops, Experimental Shops, Technical Schools, Garages, Etc.

Built in 2 sizes, 12" and 14" swing, 6' and 8' Bed.

Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Kennedy & Sons, Wm., Owen Sound, Ont.
R. McDougall Co., Galt.
Miles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Smalley-General Co., Inc., Bay City, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Standard Machy. & Supplies, Ltd., Montreal, Que
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Wood Turret Machine Co., Brazil, Ind.

LATHES, METAL TURNING
Cisco Machine Tool Co., Cincinnati, Ohio.
Williams & Wilson, Limited, Montreal, Que.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester, N.Y.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Wood Turret Machine Co., Brazil, Ind.
Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

LATHES, POLISHING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

LATHES, SINGLE PURPOSE
Baxter & Co., Ltd., J. R., Montreal, Que.
Bertram, John, & Sons Co., Dundas Ont.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Roelofson Mach. & Tool Co., Toronto, Can.
W. T. Whitehead, Son & Co., Montreal, Que.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que.

LATHES, SCREW CUTTING
Bertram, John, & Sons Co., Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Wickes Bros., Saginaw, Mich.
Hepburn, John T., Ltd., Toronto.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que

LATHES, SPEED
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que

LATHES, SPINNING
Bliss, E. W., Co., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LATHES, TOOL ROOM
Cisco Machine Tool Co., Cincinnati, Ohio.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LATHES, TURRET, HAND, HORIZONTAL
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram, John, & Sons Co. Dundas Ont.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
H. C. Dodge, Inc., Boston, Mass.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co. Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio
Mullmer-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Wood Turret Mach. Co., Brazil, Ind., U.S.A.
Williams & Wilson, Limited, Montreal, Que.

LEAD BURNING
St. Lawrence Welding Co., Montreal, Que.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor Ont.

LIFTS, PNEUMATIC
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOADERS, WAGON AND TRUCK
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

LUBRICATORS
Trahern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINERY, CORNER AND BENDING
Peck, Stow & Wilcox Co., Southington, Conn.

MILLING ARBORS
Kearney & Trecker Co., Milwaukee, Wis.

MACHINERY DEALERS
Archibald & Co., Chas. P., Montreal, Que.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Geo. N. Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, HAMMER AND NAIL
Garlock-Walker Machinery Co., Toronto, Ont.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Marten Mach. Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, MULTI-DRILLING
National Automatic Tool Co., Richmond, Ind.

MACHINERY, TRANSMISSION (POWER)
Morse Chain Co., Ithaca, New York.

MACHINES, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

MACHINES, RUNNING, BALANCING
Norton Grinding Co., Worcester, Mass.

MACHINES, MULTI-BORING
National Automatic Tool Co., Richmond, Ind.

MACHINE SHOP WORK
James Ballantyne, Montreal.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Marten Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
MacGovern & Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
J. H Williams & Co., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

MACHINE TOOLS
Williams & Wilson, Limited, Montreal, Que.

MACHINE & REPETITION WORK
Katie Foundry, Ltd., Galt, Ont.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Perrin, Wm. R., Toronto.
Williams & Wilson, Limited, Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS
Toronto Testing Laboratory, Ltd., Toronto.

METAL SAWS
Simonds Mfg. Co., Fitchburg, Mass.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Enushevsky & Son, B., Toronto, Ont.
International Metal & Trading Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
United Brass & Lead Ltd., Toronto.

METAL STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS
Can. Cartridge Co., Hamilton, Ont.

METERS, WATER
Can. Cartridge Co., Hamilton, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., T. R., Ashburnham, Mass.
Taylor, J. A. M., 518 Stair Bldg., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram, John, & Sons Co., Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

MILLING CUTTERS
Cleveland Milling Machine Co., Cleveland, O.
Kearney & Trecker Co., Milwaukee, Wis.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
The Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram, John, & Sons Co., Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss, The Geo. F., Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co, New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss, The Geo. F., Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Limited, Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

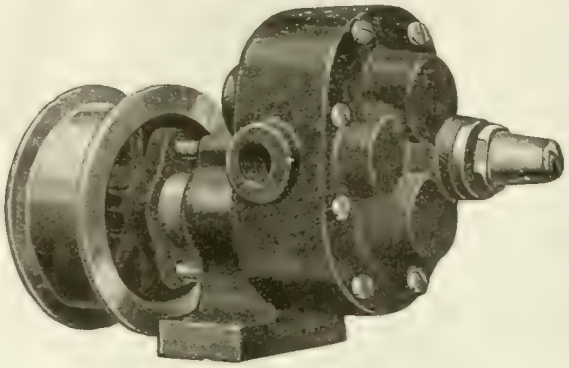
MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
The Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

LUBRICATING PUMPS

Smooth Even Flow

Large Capacity



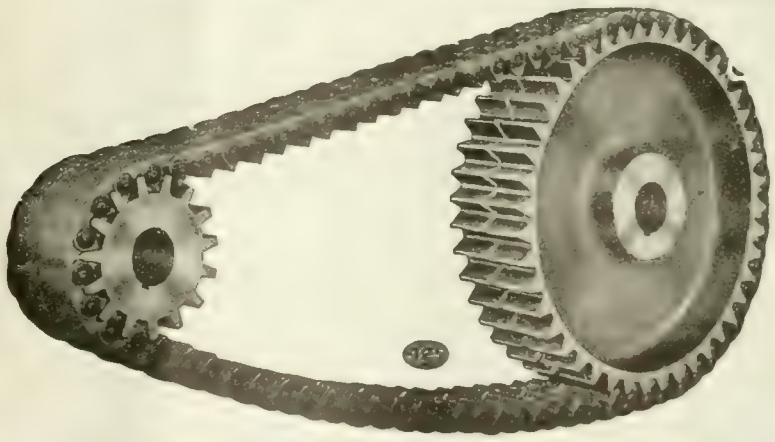
Long Life

Slow Speed

Trahern Rotary Geared Pump

with Relief Valve

TRAHERN PUMP COMPANY, Rockford, Illinois, U. S. A.



Jones & Glassco (Reg'd)

ENGINEERS

MONTREAL AND TORONTO

Specialists in

POWER TRANSMISSION CHAINS

CANADIAN AGENTS FOR

"RENOLD"

Patent Silent and Bush Roller Chains

"MORSE"

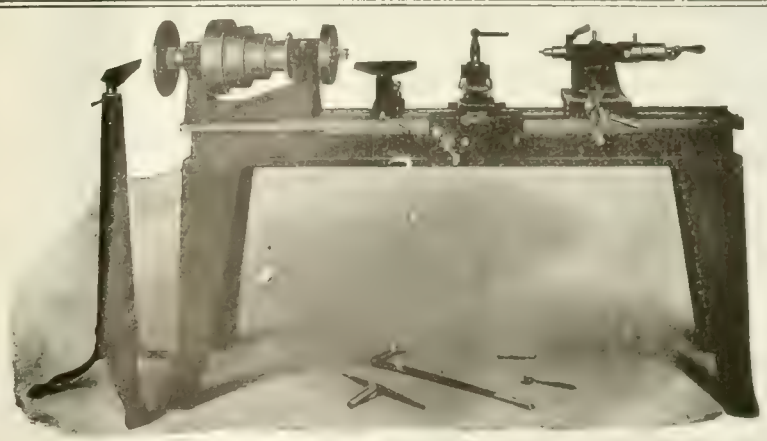
Rocker Joint Silent Chains

Chain Drives from ¼ H.P. to 5000 H.P. in successful operation

Write for particulars to

Head Office: St Nicholas Building MONTREAL

Branch Office: 1204 Traders Bank Building TORONTO



A Favorite—

Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY

EVERETT, MASS., U.S.A.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.

MOULDS, RUBBER
Elliott & Whitehall Mach. & Tool Co., Galt, Ont

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING MACHINERY, VERTICAL AND HORIZONTAL
The National Automatic Tool Co., Richmond, Ind.

MULTI-BORING MACHINES
The National Automatic Tool Co., Richmond, Ind

MULTI-TAPPING MACHINERY, VERTICAL AND HORIZONTAL
The National Automatic Tool Co., Richmond, Ind

MUNTZ METAL
Brown Copper & Brass Roller Mills, New Toronto, Ont.

NAILS
Graham Nail Works, [illegible] Canada Metal Co., Ltd., Toronto.
Page Steel & Wire Co., Adrian, Mich.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

NICKEL
Baker & Co., Inc., H., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
J. F. A. Comstedt, New York City, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Morrow Screw & Nut Co., Ltd., John, Ingersoll.
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, Ohio.

NUT MACHINES (HOT)
National Macay. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

NUT TAPPERS
Bertram, John, & Sons Co., Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse, Co., Montreal.
Sheldon's, Ltd., Galt, Ont.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS

OXYGEN, ELECTROLYTIC CELLS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford, Ont.

OXY-ACETYLENE WELDING AND CUTTING
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Baxter & Co., Ltd., J. R., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Can. Link-Belt Co., Toronto, Ont.
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
Page Steel & Wire Co., Adrian, Mich.

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

PATTERN MAKERS' LATHES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAWERS' VISES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP SUPPLIES
Oliver Machinery Co., Grand Rapids, Mich

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Dominion Pattern Works, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Greenleafs Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PEDESTALS WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
John Morrow Screw & Nut Co., Ingersoll, Ont.

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph, Ont.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.

PIERCING
Oliver Machinery Co., Grand Rapids, Mich

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE REAMERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE STOCKS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE THREADERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE TAPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE VISES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PISTON RODS, ROUGH TURNED
General Steel Co., Milwaukee, Wis.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
John Morrow Screw & Nut Co., Ingersoll, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
John Bertram & Sons Co., Dundas.
Oliver Machinery Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Limited, Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

POWER TRANSMISSION MACHINERY
Williams & Wilson, Limited, Montreal, Que.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.
Rice Lewis & Son, Toronto, Ont.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Quebec.

POLISHING MACHINES
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

PRESSED STEEL PARTS
The Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Limited, Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
The Geo F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

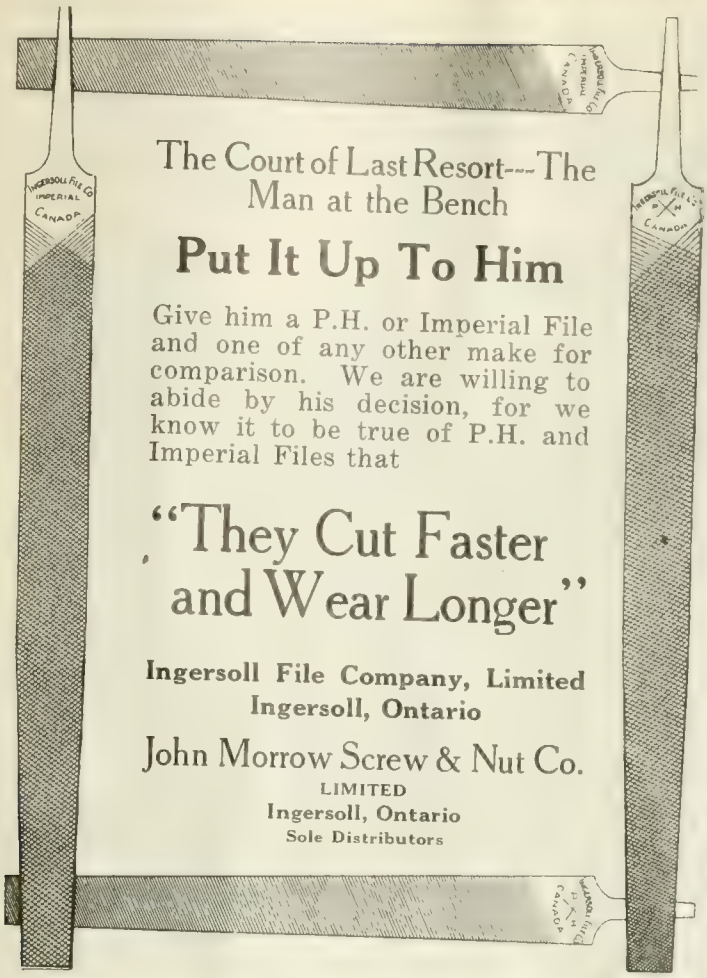
PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal, Que.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
William R. Perrin, Ltd., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.



The Court of Last Resort---The Man at the Bench

Put It Up To Him

Give him a P.H. or Imperial File and one of any other make for comparison. We are willing to abide by his decision, for we know it to be true of P.H. and Imperial Files that

"They Cut Faster and Wear Longer"

Ingersoll File Company, Limited
Ingersoll, Ontario

John Morrow Screw & Nut Co.
LIMITED
Ingersoll, Ontario
Sole Distributors

MORROW SCREWS MORROW

DRILLS

FILES

MORROW NUTS MORROW

MORROW
INGERSOLL

Best Jobbers carry "Morrow's."
By retaining our old customers and adding new ones we have found it necessary to increase our capacity —hence the new three-storey fireproof building we have just completed. This plant is now equipped and gives us facilities for giving our customers immediate deliveries of Screws, "its the second threading that does it."
Nuts (every variety of finish).
Twist Drills "will do more drilling with less re-grinding."
Ingersoll Files, "will cut faster and wear longer."

John Morrow Screw & Nut Co.
LIMITED
INGERSOLL - CANADA

Always, everywhere, use "Morrow" products. Made just a little better than seems necessary.



"TALLMANS' SPECIAL" ARCTIC METAL

a medium-priced babbitt specially adapted for Saw Mill and Woodworking machinery.

Will remain cool under exceptionally high speed.

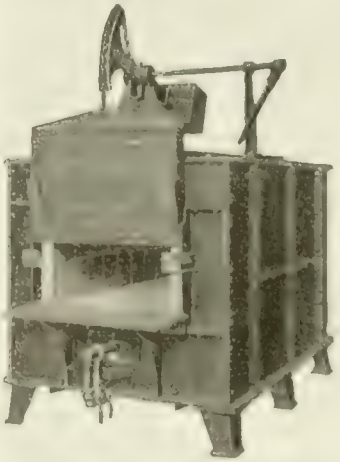
Its long life proves its efficiency.

Tallman Brass & Metal Limited
HAMILTON, ONT.

STANDARD FURNACES

OIL or GAS

Immediate delivery on all tool room types



Large Oven Furnace

For

Annealing
Carbonizing
Hardening
High Speed Steel
Lead and Salt
Oil Tempering
Forging
Riveting

STANDARD FUEL ENGINEERING CO.
1646 Woodward Ave.
Detroit, Mich.

STANDARD FUEL ENGINEERING CO. DETROIT, MICH.

Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal, Que.

PRESSES, SCREW
Barnes, W. F., & John Co., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
William R. Perrin, Ltd., Toronto.
Williams & Wilson, Limited, Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

PRODUCTION WORK
Windsor Mach. & Tool Co., Windsor, Ont.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont.
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Positive Clutch & Pulley Works., Ltd., Toronto.
J. C. Wilson & Co., Belleville, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION CLUTCH
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto
Jones & Glassco, Montreal.
Johnson, Carlyle, Mach. Co., Manchester, Conn
Williams & Wilson, Limited, Montreal, Que.

PULLEYS, BELT
American Pulley Co., Philadelphia, Pa.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Quebec.
M. L. Oberdorfer Brass Co., Syracuse, N.Y.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Darling Bros., Ltd., Montreal, Quebec.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Quebec.

PUMPS, HIGH PRESSURE
William R. Perrin, Ltd., Toronto.

PUMPS, ALL KINDS
Darling Bros., Ltd., Montreal, Quebec.
William R. Perrin, Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto, Ont.
Darling Bros., Ltd., Montreal, Quebec
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Williams & Wilson, Limited, Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

PUMPS, HAND, FOR OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

PUMPS, RUBBER CEMENT
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

PUMPS, POWER FOR OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne, Ind

PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Darling Bros., Ltd., Montreal, Quebec.
Trahern Pump Co., Rockford, Ill
Williams & Wilson, Limited, Montreal, Que.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Quebec.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, MOTOR AND BELT DRIVEN
Darling Bros., Ltd., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
M. L. Oberdorfer Brass Co., Syracuse, N.Y.

PUMPS, STEAM AND CENTRIFUGAL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester, Mass.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Boker & Co., Inc., H., Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Limited, Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Conn

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Stoll Co., D. H., Buffalo, N.Y.
Wickes & Co., Saginaw, Mich.
Williams & Wilson, Limited, Montreal, Que.

PUNCHES, CHROME, VANADIUM SHELL
Hammond Steel Co., Inc., Syracuse, N.Y.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Wickes & Co., Saginaw, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn., U.S.A.
Shore Instrument & Mfg. Co., New York City
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS
United Brass & Lead, Ltd., Toronto, Ont.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.
Niles-Bement-Pond Co., New York.

RADIAL DRILLING MACHINE, WALL
Lynd-Farquhar Co., Boston.
Wickes & Co., Saginaw, Mich.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

RAIL OVERHEAD
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

RASPS
Morrow Screw & Nut Co., John, Ingersoll, Ont.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Kelly Reamer Co., Cleveland, O.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto.
Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
The McCrosky Reamer Co., Meadville, Pa
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, BOILER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, CHUCKING
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, EXPANDING
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, TAPER, BRIDGE
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, JOBBERS
John Morrow Screw & Nut Co., Ingersoll, Ont.

REAMERS, PIPE, SHELL
Greenfield Tap & Die Corp., Greenfield, Mass.
John Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland, Ont.

REGULATORS, PRESSURE TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Rice Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto, Ont.
Steel Co. of Canada Ltd., Hamilton, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RODS, ROPE AND SPRING
General Steel Co., Milwaukee.
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

ROLLER CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Limited, Montreal, Que

ROPE, GALX, MONEL METAL, BRONZE
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

ROPE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland, Ont.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto, Ont.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT AND FOLDING
Lufkin Rule Co. of Can., Windsor, Ont.

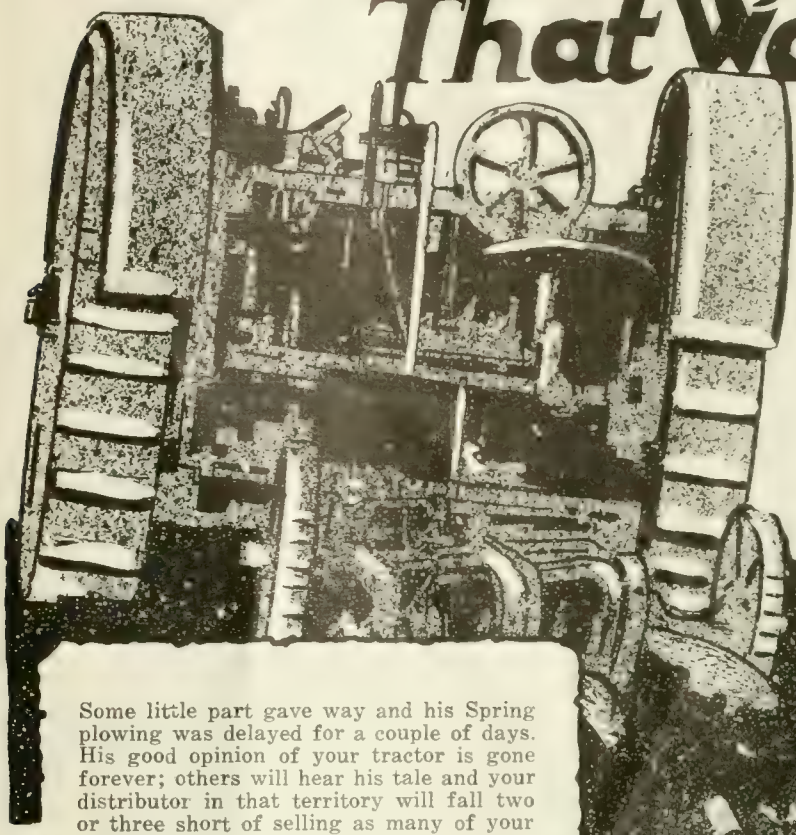
RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor, Ont.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor, Ont.

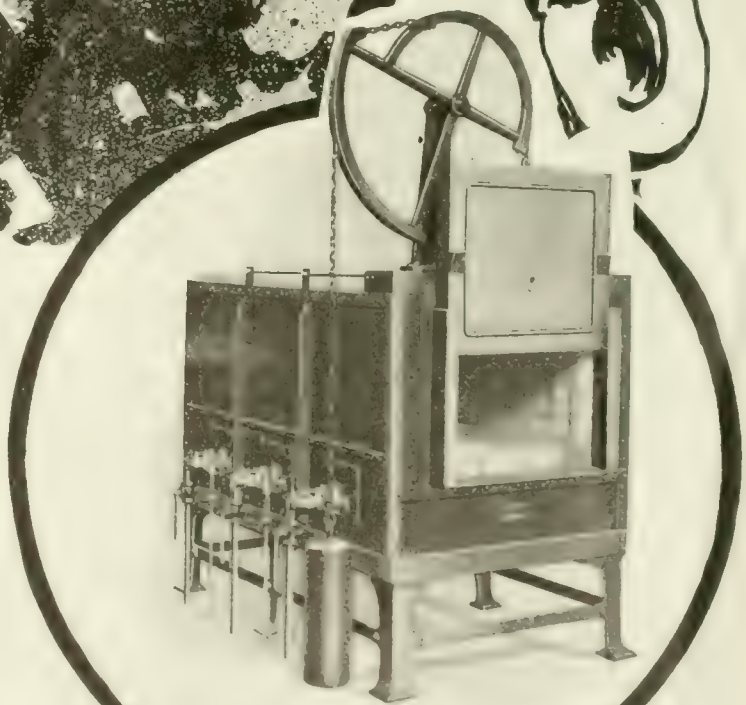
SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto, Ont
Williams & Wilson, Limited, Montreal, Que

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland, Ohio.

-And I Always Thought That Was A Good Tractor-







Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

It makes no difference whether you manufacture tractors or other machines or machine parts, unless you have the right heat-treating furnace the reputation of your product is in constant jeopardy.

You Cannot Afford to Take Such Chances

GILBERT & BARKER Heat-Treating Furnaces

insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & R. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform always, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

To-day is a better day than to-morrow—write.

Gilbert & Barker Mfg. Co.

Established 1865

SPRINGFIELD, MASS., U.S.A.

Agents: Norton & Reynolds, Mercier Terminal Bldg., 3 St. Pl. Clinton St. Boston Office: Gardner Bldg., 670 Woodward Ave., Pittsburgh Manufacturers' Bldg. Philadelphia Office: 703 Lincoln Bldg.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

SAND BLAST MACHINES
Pangborn Corporation, Hagerstown, Md.

SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SAFETY APPLIANCE GOGGLES
Willson Co., Inc., T. A., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Plewes, Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburg, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
Taylor, J. A. M., Stair Bldg., Toronto, Ont.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor, Ont.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland, O.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
United Brass & Lead, Ltd., Toronto.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
H. C. Dodge, Inc., Boston, Mass.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind., U.S.A.
Williams & Wilson, Ltd., Montreal, Que.

SCREW MACHINES, AUTOMATIC MULTIPLE SPINDLE
H. C. Dodge, Inc., Boston, Mass.
National Acme Co., Cleveland, Ohio.

SCREWS
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
National Acme Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

SCREWS, COLLAR
John Morrow Screw & Nut Co., Ingersoll, Ont.

SCREW COLLARS
Morrow Screw & Nut Co., Ltd., John, Ingersoll.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.

SCREWS, THUMB AND NUT
Morrow Screw & Nut Co., John, Ingersoll, Ont.

SECOND-HAND MACHINERY
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Williams & Wilson, Limited, Montreal, Que.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, HOLLOW HEADED
John Morrow Screw & Nut Co., Ingersoll, Ont.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Bristol Co., Waterbury, Conn., U.S.A.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Rhodes Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

SHARPENING STONES
Norton Co., Worcester, Mass.
Rice, Lewis & Son, Toronto, Ont.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown Boggs Co., Ltd., Hamilton, Canada
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Long & Allstatler, Hamilton, Ohio.
Wickes & Co., Saginaw, Mich.
A. B. Jardine & Co., Limited, Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Stoll Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal, Que.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington, Conn.

SHEETS, NICKEL, RESIST, ALLOY
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

SHEARS, PLATE CUTTING, SLITTING
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington, Conn.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, Conn.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada
Stoll Co., D. H., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

STAMPING
Canadian Cartridge Co., Ltd., Hamilton, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHEET METAL WORKING MACHINERY
Stoll Co., Inc., D. H., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London, Ontario.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHIPYARD MACHINERY

SHOP FURNITURE
Dennis Wire & Iron Works, London, Ontario.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAIN
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
Canadian Welding Works, Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Quebec.

SNIPS, TINNERS AND SHEET METAL WORKERS'
Kearney & Trecker Co., Milwaukee, Wis.
Morrow Screw & Nut Co., John, Ingersoll, Ont.

SOCKET HEAD CAP SCREWS

SOCKETS AND SLEEVES
John Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice, Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
United Brass & Lead Ltd., Toronto

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead, Ltd., Toronto.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SPLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Jas. Steele, Ltd., Guelph, Ont.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Beaver Engineering Co., Montreal, Que.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Eglund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mulliner & Eglund Tool Co., Syracuse, N.Y.
Marten Machine Co., Hamilton, Ont.
Reed-Prentice Co, Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
Wilson & Co., J. C., Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS, SPIRAL, TOOL
The Dunbar Brothers Co., Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Wilson & Co., J. C., Belleville, Ont.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Brothers Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link-Belt Co., Toronto, Ont.
Perrin, Wm. R., Toronto.
Wilson & Co., J. C., Belleville, Ont.

SPROCKET WHEELS, CHILLED THREAD
Katie Foundry, Galt, Ont.

SQUARES
Peck, Stow & Wilcox Co., Southington, Conn.

"WACO"

REGISTERED

"WACO"

TRADE MARKS

High Speed Steel

"Double Waco" Quality—for Quick Production Work.

"Turtle Brand"—High-class Tool Steels, Files and Drills.

Wortle Plates for Wire Drawers.

MANUFACTURED BY

WM. ATKINS & COMPANY, LIMITED

RELIANCE STEEL WORKS Established 1870 SHEFFIELD, ENGLAND

Sole Representatives for Canada:

MARSHALL, SON & BUNNEY

39 Richmond Street East - - - TORONTO, ONT.

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

Signed.....

Firm Name.....

St. Address.....

City.....

Prov.

SAFETY CYLINDERS
Oliver Machinery Co., Grand Rapids, Mich.
SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.
SAWS SWING
Oliver Machinery Co., Grand Rapids, Mich.
STAYBOLT TOPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.
SANDERS
Oliver Machinery Co., Grand Rapids, Mich.
SAW GUARDS
Oliver Machinery Co., Grand Rapids, Mich.
STAMPINGS, SHEET BRASS, COPPER, ALUMINUM and STEEL
Dom Forge & Stamping Co. Walkerville Ont
Hope & Sons Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.
STAMPINGS, METAL
STAMPINGS, METAL AND STEEL
Can. Cartridge Co., Hamilton, Ont.
The Gray Ball Bearing Co., Ltd., Toronto.
STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.
SAFETY CYLINDERS
Oliver Machinery Co., Grand Rapids, Mich.
STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec
SPEED LATHES
Oliver Machinery Co., Grand Rapids, Mich.
STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
STEEL BALLS
Rochester Ball Bearing Co., Rochester, N.Y.
STEEL, CRUCIBLE TOOL
Hammond Steel Co., Inc., Syracuse, N.Y.
Illingworth Steel Co., John, New York, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.
SURFACES
Oliver Machinery Co., Grand Rapids, Mich.
STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Canada, Montreal Que
Boker & Co., Inc., H., Montreal, Que
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Cruefble Steel Co., Aliquippa, Pa
STEEL CASTINGS
Joliette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Electric Steel & Metals Co., Welland, Ont.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.
Swedish Crucible Steel Co., Windsor, Ont
STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal
Union Drawn Steel Co., Hamilton, Ont
STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
STEEL, NICKEL
Firth & Sons, Thos., Montreal, Que
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.
STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Wm. Atkins & Co., Sheffield, Eng
Boker & Co., Inc., H., Montreal, Que
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., John, New York, N.Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall Son & Bunnet, Toronto, Ont
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co. Montreal, Que.
STEEL, GRIT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
STEEL, CHROME AND MANGANESE
Joliette Steel Co., Montreal, Que.
STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York, N.Y.
STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
STEEL, SPECIAL ELECTRIC ALLOY
Hammond Steel Co., Inc., Syracuse, N.Y.
STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie, Ont.
STEEL, VANADIUM
Armstrong, Whitworth of Canada, Montreal, Que
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STOCK RACKS FOR BARS, PIPING, ETC
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Limited, Hespeler, Ont
Rice, Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
STRAIGHTENING MACHINER r
Baird Machinery Co., Bridgeport, Conn
Bertrams, Ltd., Edinburgh, Scotland.
STRAND
Page Steel & Wire Co., Adrian, Mich
SYSTEMS, REMOTE CONTROL FOR OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
STORAGE AND HANDLING SYSTEMS FOR DRY CLEANERS, AND NAPHTHA
Bowser & Co., S. F., Inc., Fort Wayne, Ind
SYSTEMS, RECLAIMING, FOR OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
SYSTEMS, RAILWAY OIL, STORAGE AND HANDLING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
SYSTEMS, PAINT, OIL STORAGE AND HANDLING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
SYSTEMS, OIL STORAGE AND DISTRIBUTING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.
TABLES, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.
TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto
TANKS, GASOLINE, KEROSENE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Dominion Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
TANKS, LUBRICATING OIL STORAGE
Bowser & Co., S. F., Inc., Fort Wayne, Ind
TANKS, RUBBER CEMENT
Bowser & Co., S. F., Inc., Fort Wayne, Ind
TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TANKS, UNDERGROUND STORAGE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
TANK WAGONS
Canadian Welding Works, Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TANKS, WHEEL, FOR LUBRICATING OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng
Rice, Lewis & Son, Toronto, Ont.
TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que
TAPES—MEASURING, STEEL AND WOVEN
Lufkin Rule Co. of Can., Windsor, Ont.

TAPES, POCKET
Lufkin Rule Co. of Can., Windsor, Ont.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Victor Tool Co., Waynesboro, Pa.

TAPS, BOILER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, GUN
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, HAND
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, MACHINE RELIEVED
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, MACHINE SCREW
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, PIPE
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, STAYBOLT, "MAX" TAP
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, TAPPER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford Mass
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
L. S. Starrett Co., Athol, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.
TAP EXTRACTORS
Walton Co., The, Hartford, Conn.
THERMOMETERS, INDUSTRIAL
Taylor Instrument Co., Rochester, N.Y.
THERMOMETERS, ENGRAVED
Taylor Instrument Co., Rochester, N.Y.
THERMOMETERS, TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.
THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.
TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City
TENOVERS
Oliver Machinery Co., Grand Rapids, Mich.
TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.
THREADING TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.
THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
The Gray Ball Bearing Co., Ltd., Toronto.
Smalley-General Co., Inc., Bay City, Mich.
THUMB SCREWS AND NUTS
Canada Found's & Forgings, Ltd., Welland Ont
Morrow Screw & Nut Co., John, Ingersoll, Ont.
United Brass & Lead Ltd., Toronto
Williams & Co., J. H., Brooklyn, N.Y.
TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Williams & Wilson, Limited, Montreal, Que.
TIRE BENDERS
A. B. Jardine & Co., Limited, Hespeler, Ont.
TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
TOOL CASES
Rice, Lewis & Son, Toronto, Ont.
TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Deloro Smelting & Refining Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.
TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Wm. Atkins & Co., Sheffield, Eng.
General Steel Co., Milwaukee, Wis.
H. A. Drury Co., Montreal.
Firth & Sons, Thos., Montreal.
Hammond Steel Co., Inc., Syracuse, N.Y.
Harvey & Co., Arthur C., Boston, Mass.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunting, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Rice, Lewis & Son, Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, BENDING
Peck, Stow & Wilcox Co., Southington, Conn.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Limited, Hespeler, Ont.
Rice, Lewis & Son, Toronto, Ont.

TOOLS, ADJUSTABLE BORING
The Kelly Reamer Co., Cleveland, O.
Williams & Wilson, Limited, Montreal, Que.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
A. R. Williams Machinery Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TRACK, PORTABLE STEEL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

TRACK SYSTEMS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRANSFORMERS
MacGovern & Co., Montreal, Que.

TRANSMISSION CHAIN
Morse Chain Co., Ithaca, New York.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Coventry Chain Co., Coventry, England.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke, Que.
Wilson & Co., J. C., Belleville, Ont.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Dominion Bridge Co., Montreal, Quebec.
MacKinnon Steel Co., Sherbrooke, Quebec.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRANSVEYORS
Cowan Truck Co., Holyoke, Mass.

TROLLEYS
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Cowan Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Quebec.
Rice, Lewis & Son, Toronto, Ont.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.
Tallman Brass and Metal Co., Hamilton, Ont.

TUBING COILERS, FLEXIBLE METAL
Almond Mfg. Co., T. R., Ashburnham, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.

TURRET MACHINES, LATHES
Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Pratt & Whitney, Hartford, Conn.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURBINES, HORIZONTAL
Wilson & Co., J. C., Belleville, Ont.

TURBO GENERATOR UNITS
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURNBUCKLES
Canada Foundries & Forgings, Ltd., Welland, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Rice, Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VANADIUM STEEL
J. F. A. Comstedt, New York City, N.Y.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

VISE STANDS, PORTABLE
Williams & Co., J. H., Brooklyn, N.Y.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Williams & Wilson, Limited, Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Williams & Wilson, Limited, Montreal, Que.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Morrow Screw & Nut Co., Ltd., John, Ingersoll.
Norton, Ralph B., Agent, Montreal.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
United Brass & Lead, Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Toronto Iron Works, Ltd., Toronto.

WELDING, WIRE
Page Steel & Wire Co., Adrian, Mich.

WELDING, ELECTRIC, SPOT, BUTT, ETC
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
Taber Mfg. Co., Philadelphia, Pa.

WELDING GOGGLES
Strong, Kennard & Nutt Co., Cleveland, O.

WELDING RODS AND WIRE
Page Steel & Wire Co., Adrian, Mich.
Welding & Supplies Co., Montreal, Que.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Anderson & Co., of Canada, Geo., Montreal, Que.
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal, Que.

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que.
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

WIRE, CAST STEEL AND MUSIC
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRING MACHINES
Quickwork Co., St. Marys, Ohio.

WRENCHES, PIPE, POWER
Peck, Stow & Wilcox Co., Southington, Conn.

WROUGHT IRON PIPE BENDS
James Ballantyne, Montreal.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.
Page Steel & Wire Co., New York, N.Y.

WIRE FENCING

WIRE, COPPER, CLAD STEEL

WIRE, LINK FABRIC
Page Steel & Wire Co., Adrian, Mich.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Graham Nail Works, operated by Canada Metal Co., Ltd., Toronto.
Page Steel & Wire Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Page Steel & Wire Co., New York, N.Y.

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver Harris Co., Ltd., Walkerville, Ont.

WIRE SPRING
Page Steel & Wire Co., Adrian, Mich.

WIRE STEEL, BRASS, COPPER,
Page Steel & Wire Co., New York.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE, TELEPHONE, TELEGRAPH, GALVANIZED AND ELECTRICAL
Page Steel & Wire Co., Adrian, Mich.

WIRE, WEAVING, MONEL METAL, BRASS COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Canadian Driver Harris Co., Limited, Walkerville, Ont.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

WOOD TRIMMERS
Oliver Machinery Co., Grand Rapids, Mich.

WOOD LATHES
Oliver Machinery Co., Grand Rapids, Mich.

WOOD MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

WOOD SHAPERS
Oliver Machinery Co., Grand Rapids, Mich.

WRENCHES
Williams & Co., J. H., Brooklyn, N.Y.
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canada Foundries & Forgings, Ltd., Welland, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

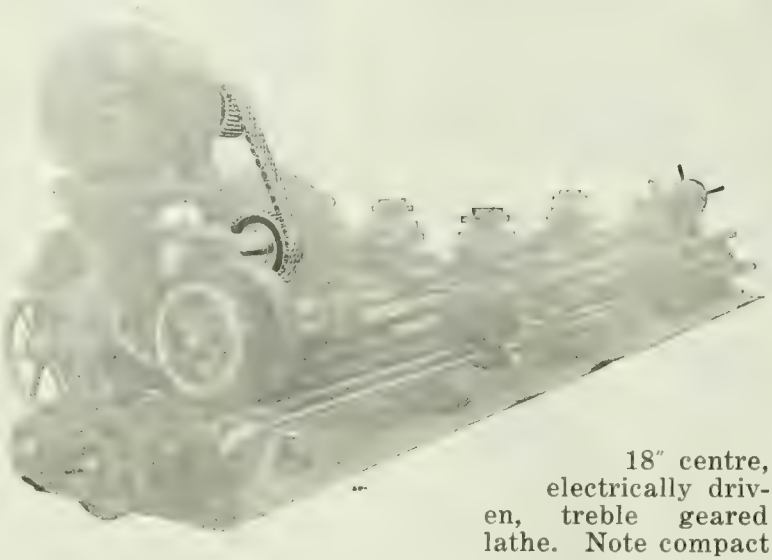
WOVEN STEEL PARTITIONS
Page Steel & Wire Co., Adrian, Mich.

WRENCHES, AUTOMOBILE, NARROW JAW, MONKEY AND SCREW
Remis & Call Hdwe. & Tool Co., Springfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP AND POWER
Aikenhead Hardware Co., Toronto, Ont.
Remis & Call Hdwe. & Tool Co., Springfield, Mass.
Peck, Stow & Wilcox Co., Southington, Conn.
Rice, Lewis & Son, Toronto, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Remis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

WRENCHES, SOCKET
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

"THE COVENTRY" CHAINS



18″ centre, electrically driven, treble geared lathe. Note compact arrangement of drive.

THE REASONS FOR
CHAIN TRANSMISSION

Will work at a high speed and in either direction. Positive, yet flexible, turning movement. Will work on centres too long for gears and too short for belts, so that drive can be arranged to suit either details of design.

Unaffected by heat or cold — give positive velocity ratio, — minimize journal friction. Will transmit considerable power with high efficiency, which is retained. Increase output, give uniform quality of product, consume minimum of power. Minimum attention required for repairs or adjustment.

The Coventry Chain Company, Limited, Coventry, England

Cables: CHAINS, COVENTRY. Codes: A.B.C., 3rd and 4th Editions
WESTERN UNION and MARCONI

STEEL TUBING

FOR Agricultural Implements, Trolley Arms, Fence Posts, Bedsteads—and all kinds of manufacturing purposes. Reliable quality, uniform in size, 14 to 20 gauge, size ⅜″ to 2″ outside diameter.

STANDARD TUBE & FENCE COMPANY, LTD.
WOODSTOCK, ONT.

INDEX TO ADVERTISERS

(Continued from page 178.)

Sidney Tool Co. ... 150
Silver Mfg. Co. ... 129
Simonds Canada Saw Co. ... 28
Skinner Chuck Co. ... 142
Sleeper & Hartley, Inc. ... 155
Sloan Instrument Co. ... 145
Smalley General Co., Inc. ... 152
Smith, N. ... 87
Standard Fuel Engineering Co. ... 161
Standard Optical Co. ... 165
Standard Tube & Fence Co. ... 168
Starrett Co., L. S. ... 29
Steel Co. of Canada ... 3
Stevens Turret Machine Co. ... 115
St. Catharines Machinery Co., Ltd. ... 90
St. Lawrence Welding Co. ... 75
Stull Co., D. H. ... 142
Strong, Kennard & Nutt Co. ... 144
Swedish Steel & Importing Co. ... 38

T

Tabor Mfg. Co. ... 108
Taft Pierce Co. ... 113
Tallman Brass & Metal Co. ... 161
Taylor Instrument Co. ... 17
Toronto Testing Laboratory, Ltd. ... 144
Toronto Tool Co. ... 98
Trabon Pump Co. ... 159

U

Union Carbide Co. ... 42
Union Mfg. Co. ... 137
United States Machine Tool Co. ... 131
Universal Grinding Machine Co. ... 145

V

Vanadium Alloys Steel Co. ... 191
Victor Saw Works ... 31
Victor Tool Co. ... 157
Victoria Foundry Co. ... 94
Volta Mfg. Co. ... 134
Vulcan Crucible Steel Co. ... 85

W

Walcott Lathe Co. ... 40
Walton Co., The ... 140
Warner & Swasey Co. ... 102
Welding & Supplies Co. ... 94
Wheel Truing Tool Co. ... 143
Whitcomb-Blaisdell Mach. Tool Co. 124
Whitney Mfg. Co. ... 144
Whitney Mfg. Co. ... 114
Wickes Brothers ... 132
Wilkinson & Kompass ... 143
Williams & Wilson Limited ... 122 123
Williams Machy. Co., A. R. ... 75
Williams & Co., J. H. ... 22
Whitman & Barnes Mfg. Co. ... 10
Wilson & Co., T. A. ... 145
Wilson & Co., J. C. ... 146
Wilt Twist Drill Co. ... 7
Windsor Machine & Tool Works ... 94
Wood Turret Machine Co. ... 87
Wright Mfg. Co. ... 97

Z

Zenith Coal & Steel Products ... 90

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XXI. TORONTO, JUNE 5, 1919 No. 23

EDITORIAL CONTENTS

MAKING STEEL IN CANADA 567

SHOP ARITHMETIC—PROPORTION AND RATIO 573

JIGS, FIXTURES AND SPECIAL MACHINES—CONTINUED 575

WELDING AND CUTTING 581

WHAT OUR READERS THINK AND DO 584

DEVELOPMENT IN SHOP EQUIPMENT 586

EDITORIAL 588

MARKET DEVELOPMENTS 590

SELECTED MARKET QUOTATIONS 76

INDUSTRIAL DEVELOPMENTS 80

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, Pres. H. T. HUNTER, Vice-pres. H. V. TYRRELL, Gen. Man.

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmers' Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, Power House, Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A. R. KENNEDY, Managing Editor. B. G. NEWTON, Manager.

Associate Editors: J. H. RODGERS, W. F. SUTHERLAND, T. H. FENNER.

Eastern Canada Representative: F. L. Jennings; Ontario Representative: S. S. Moore; Toronto and Hamilton Representative; W. E. G. MacDonald.

CHIEF OFFICES:

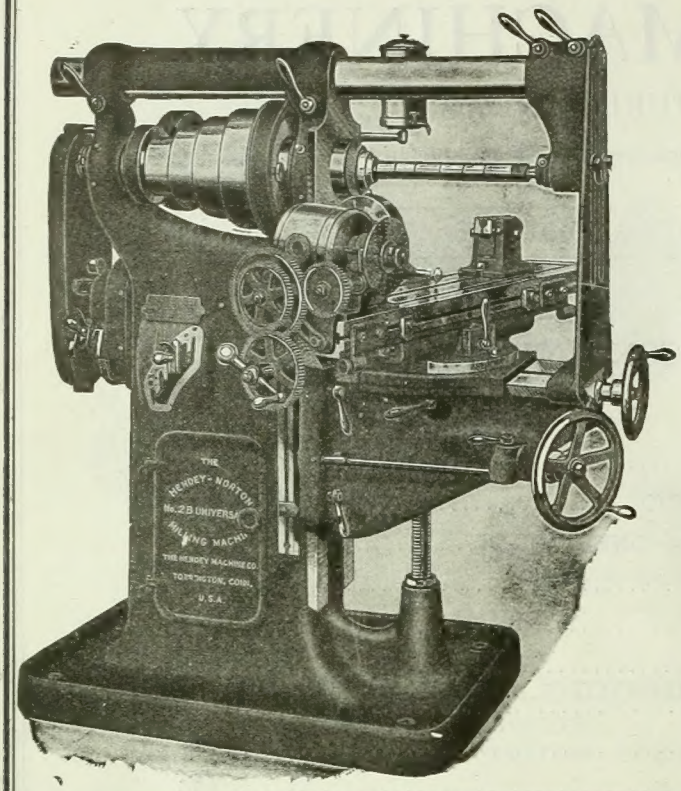
CANADA—Montreal, Southam Building, 128 Bleury Street, Telephone 1004; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 1207 Union Trust Building, Telephone Main 3449.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable address: Atabek, London, England.

UNITED STATES—New York, A. R. Lowe, Room 620, 111 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 734, Old South Building, Telephone Main 1204. A. H. Byrne, Room 1401, Lytton Bldg., 14 E. Jackson Street, Chicago, Telephone Harrison 1147.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $3.00 a year; United States $3.50 a year; other countries, $4.00 a year; Single Copies, 15 cents. Invariably in advance.

Anybody Can Operate This Miller



and Turn Out a Pile of Work so Simple to Operate is the

"HENDEY"

Skilled mechanics are scarce these days—but anyone can run a machine of its simplicity and turn out work accurately and fast without trouble.

All Feeds positive driven through gearings giving 18 changes.

This is the universal type—designed to handle all milling operations performed on machines of this character, either with regular equipment or by aid of attachments, which can be supplied for increasing efficiency and scope of machine.

Write for full description

The Hendey Machine Co.

Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.

INDEX TO ADVERTISERS

A
Acme Machine Tool Co. 8
Aikenhead Hardware Co. 79
Albany Hardware Spec. Co. 104
Algoma Steel Corp. Co. 4
Allentown Experimental Works 90
Almond Mfg. Co. 139
American Pipe Bending Mach. Co. 110
Anderson, Geo. A. 142
Armstrong Bros. Tool Co. 111
Atkins & Co., Ltd., Wm. 165
Atlas Press Co. 89
Armstrong Whitworth of Canda. 13
American Lead Pencil Co. 160
American Pulley Co. 146

B
Baird Machine Co. 144
Ballantyne, Jas. 142
Banfield, W. H. 117
Barnes, Wallace, Co. 89
Becker Milling Machine Co. 125
Bellevue Industrial Furnace Co. 135
Bernard Industrial Co., A. 155
Bertram & Sons Co., John 1
Bertrams, Ltd. 87
Betts Machine Co. 5
Becknell-Thomas Co. 17
Beaudry Co., Inc. 142
Blount, J. G. 159
Brantford Oven & Rack Co. 87
Bridgeford Machine & Tool Works. 5
Bristol Company 142
Bristol Machine Tool Co. 128
Brockville Foundry Co. 143
Brown, Boggs Co. 11
Brown Eng. Corp. 95
Brown's Copper & Brass Rolling Mills 33
Budden, Hanbury, A. 87
Butterfield & Co., Inc. 132

C
Canada Foundries & Forgings, Ltd. 24
Canada Machinery Corporation Outside back cover
Canada Metal Co. 19
Can. Blower & Forge Co. 100
Can. Consolidated Rubber Co. 83
Can. Desmond-Stephen Co. 126
Can. Fairbanks-Morse Co. 46
Can. Ingersoll-Rand Co. 9
Can. Winkley Co. 143
Can. Link Belt Co. 15
Can. Driver Harris Co., Ltd. 37
Can. Standard Products 91
Carborundum Co. 93
Carlyle Johnson Machine Co. 8
Carter Welding Co. 104
Chapman Double Ball Bearing Co. 108
Cincinnati Electrical Tool Co. 143
Cleveland Twist Drill Co. 151
Cincinnati Milling Machine Co. 119
Cisco Machine Tool Co. 132
Classified Advertising 90
Clipper Belt Lacer Co. 20
Commercial Camera Co. 136
Consolidated Optical Co. 143
Consolidated Press Co. 114
Cook, A. S. 126
Cleveland Pneumatic Tool Co. of Canada. 149
Coventry Chain Co. 168
Cowan Truck Co. 109
Curtis Pneumatic Mach. Co. 27
Cushman Chuck Co. 139

D
Darling Bros., Ltd. 144
Davidson Mfg. Co., Ltd., The Thos. 75
Davidson Tool Mfg. Corp. 39
Davis-Bournonville Co. 144
Diamond Saw & Stamping Works. 30
Dickow, F. C. 88
Dom. Foundries & Steel 121
Drury Co., H. A. 19
Dunbar Bros. Co., The 146

E
Eastern Machine Screw Corp. 139
Electric Steel & Metals Co. 22
Elliott & Whithall 94
Ellis & Co., P. W. 91

F
Fetherstonbaugh & Co. 87
Fox Machine Co. 153
Firth & Sons, Thos. 9
Fitchburg Grinding Mach. Co. 145
Frost Mfg. Co. 142
Ford Chain Block & Mfg. Co. 96
Ford-Smith Machine Co. 10
Foss Mach. & Supply Co., Geo. F. Inside back cover
Forrest, Jackson & Forrest 145
Foster Machine Co. 116
Franklin Mfg. Co. 24
Fry's (London), Ltd. 28

G
Garlock-Walker Machy. Co. 91
Garvin Machine Co. 126
General Steel Co. 22
Geometric Tool Co. 77
Giddings & Lewis Mfg. Co. 106
Gilbert & Barker Mfg. Co. 163
Gisholt Machine Co. 44-45
Gooley & Edlund, Inc. 105
Grant Gear Works 144
Grant Mfg. & Machine Co. 131
Gray Ball Bearing Co. 121
Graton & Knight Mfg. Co. 36
Greenfield Machine Co. 130
Greenleafs, Ltd. 87

H
Hall & Sons, Ltd., John H. 14
Hamilton Gear & Machine Co. Front cover
Hanna & Co., M. A. 9
Hardinge Bros. 133
Harbinson-Walker Refactories 89
Hawkridge Bros. 88
Heald Machine Co. 25
Hendey Machine Co. 170
Hepburn, John T. 92
High Speed Hammer Co., Inc. 108
Hinckley Mach. Works 143
Hoefer Mfg. Co. 127
Homer & Wilson 95
Hope & Sons, Henry 95
Hoyt Metal Co. 19
Hunter Saw & Machine Co. 30
Hurlburt-Rogers Machinery Co. 21

I
Illinois Tool Works 81
Independent Pneumatic Tool Co. 109
Ingersoll File Co. 161
International Malleable Iron Wks. 34

J
Jacobs Mfg. Co. 140
Jardine & Co., A. B. 13
Johnson Machine Co., Carlyle 8
Joliette Steel Co. 143
Jones & Glassco 159
Joyce-Koebel Co. 95

K
Katie Foundry Co. 110
Kayser, Ellison & Co. 12
Kelly Reamer Co. 118

L
Landis Machine Co. 21
Landis Tool Co. 131
Latrobe Electric Steel Co. 26
LeBlond Mach. Tool Co. 13
Lindsay, John 89
Lufkin Rule Co. 89
Lynd-Farquhar Co. 18

M
MacGovern & Co. 91
MacKinnon Steel Co. 38
MacLean's Magazine 165
Manitoba Steel Foundries, Ltd. 142
Marshalltown Mfg. Co. 135
Marten Mach. Co. 117
Matheson & Co., I. 90
Matthews & Co., Jas. H. 42
McDougall Co., Ltd., R. 38
McLaren, J. C., Belting Co. 144
Morse Twist Drill & Mach. Co. 149
Mechanical Engineering Co. 127
Metalwood Mfg. Co. 103
Modern Tool Co. 107
Morrow & Sons, John 161
Morris Crane & Hoist Co., Herbert 137
Morton Mfg. Co. 87
Murchey Machine & Tool Co. 140
Mulliner-Enlund Tool Co. 92

N
National Acme Co. 141
Nat. Automatic Tool Co. 35
Nicholson File 112
Niles-Bement-Pond. Inside front cover
Northern Crane Works 27
Norton, A. O. 144
Norton Co. 42
Norton Grinding Co. 43
Nova Scotia Steel & Coal Co. 18

O
Oakley & Sons, John 96
Oakley Chemical Co. 23
Oliver Machinery Co. 99

P
Page Steel & Wire Co. 120
Pangborn Corporation 155
Parmenter & Bulloch Co. 144
Peerless Machine Co. 114
Perrin, Wm. R. 104
Philadelphia Gear Works 96
Pink Co., Thomas 94
Perfect Machine Co. 157
Pittsburgh Crushed Steel Co. 112
Plewes, Ltd. 87
Positive Clutch & Pulley Works. 143
Pratt & Whitney. Inside front cover
Prest-O-Lite Co. 111
Publisher's Page 2
Puro Sanitary Drinking Fountain Co 88

Q
Quickwork Co. 98

R
Racine Tool & Machine Co. 28
Reed-Prentice Co. 41
Rickert-Shafer Co. 129
Rochester Ball Bearing Co. 144
Rockford Drilling Machine Co. 110
Rockwell Co., W. S. 144
Roelofson Machine & Tool Co. 84
Ridout & Maybee 87

S
Seneca Falls Mfg. Co. 96
Shipman & Co., H. C. 87
Shuster Co., F. B. 145

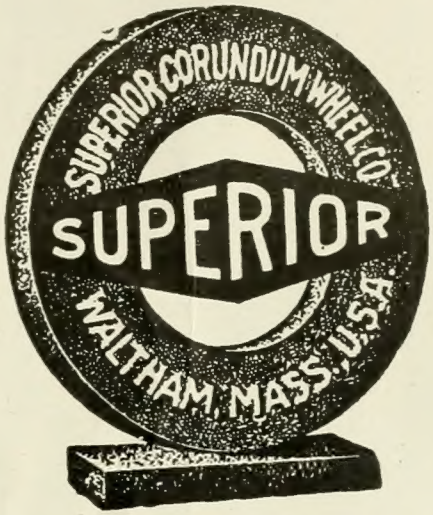
(Continued on page 176.)

QUALITY • Foss SERVICE

Foss MACHINERY AND MILL SUPPLIES

Foss

"Superior" Grinding Wheels



Fast and Cool Cutting

Durable and Uniform

Vitrified Silica or Semi-Vitrified and Elastic process.

Shapes: Dish or saucer wheels, cups and cylinders. Also special shapes for drill and tool grinders. All sizes, grits and grades, ⅜ in. diameter and up.

It is most important that the proper shape and quality of grinding wheel is used for every job.

"FOSS" Service gives special attention to using the right wheel in the right place. We have a large stock of shapes and qualities on hand for prompt shipment.

Tell us your needs and you'll get the wheel that will serve you best.

We are Representatives for the following lines:

TUNGSTEN SAW BLADES.
MOOR BROS. FILES.
GRAY PLANERS.
FRASER GRINDERS.
MUELLER RADIAL DRILLS AND LATHES.
SYDNEY ENGINE LATHES.
CINCINNATI ELECTRIC DRILLS AND GRINDERS.
ELMIRA WOOD SPLIT PULLEYS
STANDARD BOLT CUTTERS.
RACINE MACHINE SAWS.
McARTHUR BELTINGS.
WALLACE BENCH PLANER.
KEMPSMITH MILLING MACHINES
SEBASTIAN LATHES.
MONARCH LATHES.
CHAMPION TOOLS.
SILVERS DRILLS.
SWEETLAND CHUCKS.
SMITH & MILLS SHAPERS
and many others.

The Geo. F. Foss Machinery & Supply Co., Limited

305 St. James Street Montreal, Que.

QUALITY Foss SERVICE

FOUR FEATURES OF THE C.M.C. HEADSTOCK, on quick change geared lathes.

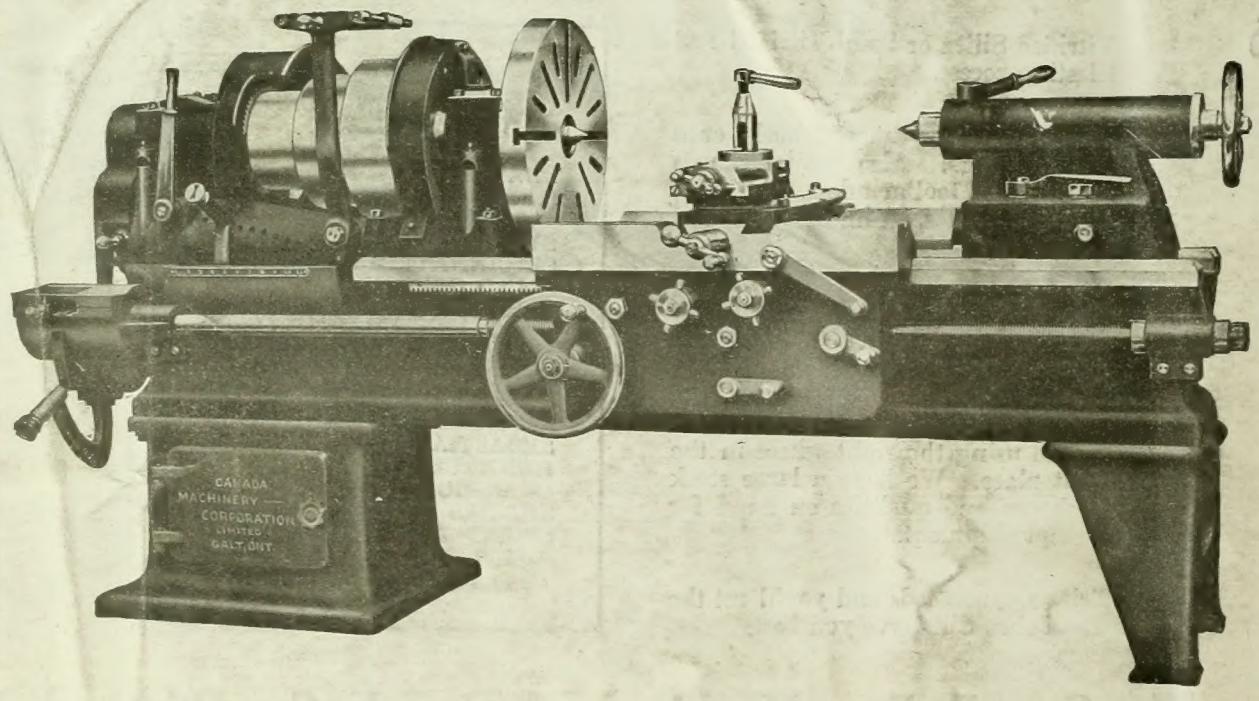
C.M.C.

(1) The three step cone double back geared drive permitting the use of extra wide belts and resulting in a strong drive combined with ample number of spindle speeds.

(2) The quick change gear mechanism which enables the operator to cut practically all the threads in every-day use without calculation or removal of gears.

(3) Our improved belt shifter which besides saving time forms a safety device preventing injury to the operator.

(4) Split phosphor bronze bearings with extra large oil chambers fed through large holes fitted with instantly removable plugs. No squirting with small oil cans through minute oil holes.



CANADA MACHINERY CORPORATION, LIMITED, GALT, ONTARIO

Toronto Office and Warerooms: Brock Avenue Subway